RAILROAD GAZETTE

FRIDAY, DEC. 8, 1893.

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Contributions.

Rule 510 on the New York, New Haven & Hartford.

N. Y., N. H. & H. R. R.
Superintendent's Office, Air Line Division,
NEW HAVEN, CONN., Nov. 27, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

On reading the communication of "Ajax" and your editorial of Nov. 24, it occurred to me that Rule 510 as adopted by this road might be of interest to your readers. The rule is as follows:

510. "Complete" must not be given to any order for delivery to a train of inferior right until the signatures of the conductor and engineman of the train which is, either by time-table, rule or special order, of superior right, have been obtained and transmitted. . . . In signing orders the conductor and engineman must each sign for himself, unless in special cases exceptions are made by the Superintendent to the train of inferior right when acquiring additional rights, and the exception is so stated on the order itself.

The rule was drafted and put in force by Mr. C. H. Platt, General Superintendent, about two years ago. Some apprehension was felt at the time of the adoption of the rule that it might cause frequent and serious delays, but experience has shown that the fears were groundless, and after the first few days we suffered no more delays than formerly.

The use of the rule has saved us a collision in one instance that we know of, and has thus justified its existence and atoned for all past or future delays on account of it. The only other change that was found desirable on account of the adoption of this rule was the addition of the following to Form J:

When necessary to hold a train, which is either by time-table, rule or special order of superior right, for further orders making definite meeting points with trains of inferior right; the following will be used:

No. —— (or Extra ——), Engine ——, will not leave —— until this order is annulled.

(NOTE.—This order must not be used when Form A can be used for the original order.)

A. S. OSTRANDER.

Cars Do Not Depreciate According to Their Mileage.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Might I inquire what relation the rate for car service on freight cars bears, or should bear, to the cost of repairs? When I talk to my friends who believe in the mixed per diem principle they tell me that the mixed system is more just and fair than the straight per diem, and when I ask where the justice and fairness come in they say that the rate per day is intended to cover the interest on the cost or value of the car and the mileage is to pay for the cost of repairs, which they state is about half a cent a mile. If I challenge the correctness of this last assertion they get out big tables of figures showing that for this or that road the expense of repairing freight cars is somewhat near one-half cent per mile run. About this time one of us has to catch a train and the discussion closes with neither one of us much wiser.

Now I may easily be wrong—I am frequently—but what I do not see is what this expense for the repairs of everybody's freight cars run on my railroad has to do with the expense that another fellow will be put to in repairing his cars when I get through with them.

Even if these very railroads interchange an equal number of cars and run these cars an equal number of miles I can hardly see why I should pay mileage for the other railroad's cars at the rate at which the other railroad repairs its cars and my cars per mile run. How much less should I be called upon to pay mileage at the rate at which I am myself repairing the foreign railroad's cars and my own. I can understand when I return a car to which I have made as few repairs at my own expense as I can that I should give the owner something for depreciation of the car, but I really do not believe that a car depreciates one-half cent a mile when it runs 150 miles a day and I am sure it depreciates more than one-half cent a mile when it is only run one mile a day.

I do not at all see the equity of having to pay $7.50, or even $5, per 1,000 miles, when I have run the other man's car so many miles in three or four days, and then have him pay exactly the same amount if he has run my car the same number of miles and has been three months in doing it.

Of course, the reply will be that on the average such things will even each other up, and that if I pay on the average as much per mile as it takes on the average to repair all the cars in the country, then everything will be fair. This might be true if every road spent as much on an average as every one else, and if every road ran its foreign cars as many miles a day as every one else. But this is not the case, and the proposed mixed per diem rule, like the present mileage rule, is for the advantage of the railroads who spend as little as they can on repairs and run other people's cars as few miles a day as they can. H. D. W.

Railroad Romances.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reading Mr. Herbert D. Ward's story entitled "The Semaphore,' in the December issue of *Scribner's Magazine*, I found several statements which greatly confused me.

The writer states that the signalman held a train five hours, or until the engineer apologized to him. Isn't this tough railroading?

Again, an order was given to train 114 to use 55 minutes time over No. 20, train No. 20 being one hour and 55 minutes late. This was certainly working terribly close to No 20; however could they do it! And wasn't the discipline on this road extremely lax, when it was customary for freight crews to disregard distant signals?

Why, instead of monkeying with that pin, didn't the signal man go and flag the track? He could have been frozen to death just as easily. He must have got badly rattled. He certainly had no business to allow No. 114 in on the block while No. 42 had not yet cleared it. Where was No. 42's flagman? How could the Superintendent have crawled out of this accident after allowing this man to make such overtime?

The story is a pretty one, but it sounds to me somewhat like a lie. W. S. S.

[A skillful writer whose reputation was chiefly made in the realm of fact once said that he found himself a complete success as a writer of fiction provided he always introduced just the right percentage of fact. Evidently Mr. Ward has introduced too large a percentage of fact, for one of his readers at least, and some of his facts "aint so." But the first object of a story is to entertain the reader and that Mr. Ward does with great success. Moreover, the specific criticisms offered by W. S. S. are mostly explainable without imputing ignorance to the writer of the story. Our correspondent evidently belongs to a hustling road out west somewhere; he should note the fact that the scene of this story is laid on the Boston & Albany, a road which in some repects differs from the hustlers. It is a combination of Riverside and South Framingham with the proper imaginary touches to make it sound well. There is no doubt that Mr. Ward interviewed actual railroad men, and put himself in their places as faithfully as he could, but he forgot to have them revise his manuscript. The story about holding a freight train five hours is a bona fide railroad man's story, we have no doubt. It sometimes happens that a signalman does hold a train a long time just for cussedness; and in telling the story he might naturally exaggerate the time, even to five hours. Making a freight clear a passenger train one hour is also an incident drawn from real life. Our correspondent is doubtless familiar with train rules which give trains half a second leeway at meeting points, but on the Boston & Albany 30 minutes is allowed in some cases. Cautiousness is bred in the bone down that way, as we all know from the policies of some of the old fire insurance companies, which are restricted to stone walls and stipulate that the walls must be kept constantly under water. The statement that freight trains disregard distant signals is a blunder of the story writer. He learned that the distant signal was not generally pulled off for freight trains, and, starting with the fact that the clear indication of the signal did not concern them, assumed that the same was true of the caution indication. The signalman had no control over the approach of the freight train, for the reason that the block system, operated by men, is not in use where this story was plotted. It is true that the signalman got badly rattled, but how are you going to make stories and sell magazines if you don't get your hero into a tight fix? But the radical fault of the story is the idea that a hero should be made out of a man who has such bad judgment as to refuse a relief when he has been on duty 48 hours. He was a plucky crank who had no business on a railroad. There they want pluck—and sanity.—EDITOR RAILROAD GAZETTE.]

Block System on Single Track Railroads, with the Interlocking Staff System.

The Johnson Railroad Signal Company,
RAHWAY, N. J., Nov. 16, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with much interest your article on these subjects, and comments thereon by "General Manager" and Mr. Arthur H. Johnson. Mr. Johnson shows very clearly that there is a system which effectually prevents head collisions, outside of automatic signals, but he does not appear to have dealt with every point raised by "General Manager." For the information of "General Manager" and others, I offer the following explanations of the working of the interlocking staff system: First, there is the absolute system, which prevents head and rear collisions. Second, there is the permissive system, which prevents head collisions but not rear. Third, there is a combination of the staff and block system, which gives the facilities of the permissive feature, but with absolute security from head and rear collisions.

The absolute consists of an instrument at each end of the section, each instrument containing any required number of staffs. These two instruments are called a set and are so constructed that when a staff is taken from one it must either be replaced in the same instrument or placed in the other instrument. Each instrument electrically controls the other through the medium of the operator. The possession of a staff is the authority for the engineman to proceed from one instrument to the other; therefore two enginemen cannot occupy the section governed by those instruments at one and the same time.

The permissive system possesses the features above enumerated, except that with it any required number of trains may follow one another from instrument No. 1 to instrument No. 2, or *vice versa*. This is accomplished by the addition to the set of absolute instruments of one special or ticket staff, each instrument being specially adapted to receive said ticket staff and equipped with a receptacle for any required number of tickets. The whole of the tickets must be in the proper receptacle of one instrument or the other before an absolute staff can be taken from either instrument. It is necessary for the whole of the tickets and the ticket staff to be at the end which wishes to send forward the series of trains. Assume these to be at No. 1, and all absolute staffs to be in the instruments, the operator there is in a position by the permission of operator No. 2 to forward any number of trains that may be agreed upon, or to give permission to operator No. 2 to send one or more trains to No. 1 by the absolute staffs. No. 1, having sent several trains to No 2 with permissive tickets, it is necessary for him to send the remainder of tickets, if any, and the ticket staff, to No. 2 by the last train of the series. No absolute staff can be removed from either instrument when the ticket staff is out.

Signals for Combination of Staff aud Block Working.

The combination of staff and block consists of a subdivision of any train staff section, whereby absolute security is obtained with the facilities secured under the permissive system. This consists of the permissive instruments at each end of the staff sections, and in addition thereto one or more simple block towers, according to the requirements of traffic, consisting of outdoor signals, apparatus, instruments, cabin and operator.

In illustration of the operation of this staff and block system I append a diagram of one staff section with an intermediate block station. We will follow the movements of traffic between No. 1 and No. 2, staff stations, assuming that two trains are required to pass from station 1 to station 2, and then one or more from station 2 to station 1. The first train being ready to leave station 1, operator asks station 2 to release his staff instrument. Obtaining the release, he gets a ticket from the instrument and hands it to the engineman. He next asks for release on his block instrument from station A, on receiving which he clears his signals and the train proceeds. Operator at A having received notification of train having left station 1, gets released on his block instrument from station 2, and clears his signals. Train having passed A, the operator puts back his signals to danger, and notifies station 1 that train has passed him. Station 1 then gives the remaining tickets and ticket staff to engineer of second train. He then gets released on block instrument from station A, clears his signals, and train proceeds. First train is now between station A and station 2, and second train is between station 1 and station A. First train arrives at and passes station 2, delivering ticket to operator. Said operator notifies station A that train has passed him. Operator at station A, knowing that a train is proceeding toward him from station 1, asks station 2 for release on block instrument and, having received it, clears his signals. Second train proceeds to and passes station 2, delivering to operator

all tickets and ticket staff. Operator at station 2 unlocks his ticket box with ticket staff, puts in all tickets, locks up ticket box and places ticket staff into instrument, notifying station 1 and station *A* that second train has arrived. Operator at station 2 is now in a position to obtain permission and send one or more trains in the opposite direction, or to give permission to station 1 to send trains to station 2 with the absolute staffs.

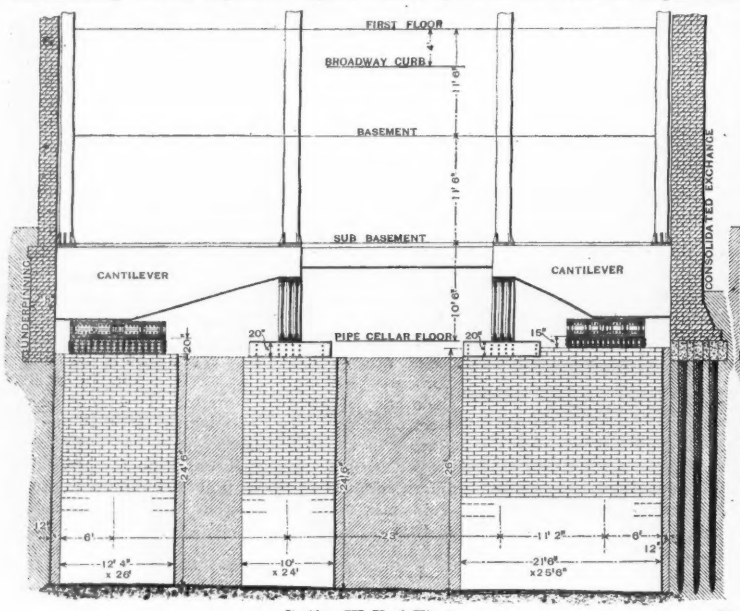
As this combined system involves additional first cost and adds to cost of maintenance, it would appear to be better where practicable to introduce passing sidings and the absolute staff system throughout, instead of the combined system. It will be seen from the foregoing that there is no dependence placed on the operator as to whether there is a train in the section or not. This also disposes of "General Manager's" assertion that nothing but the expensive signal, worked by the electric circuit through the rails, will afford adequate protection for a single track road. The assumption that the automatic system referred to gives absolute security from head collisions is without foundation; the fact being that this system is necessarily permissive, as the time interval rule shows. These signals are, of course, subject to derangement, and trains have at times to pass them at danger, and at such times the signals lose their significance, as it is impossible for an engineman to determine whether the signal remains at danger in consequence of the section being occupied, or from derangement.

In considering this subject it should be borne in mind that the operators now employed under the dispatching system would be sufficient to take care of the interlocking staff system in its permissive form, and very few more would be required for the absolute system. Increased confidence engendered by this system will expedite train movements. The cost of installation and maintenance is small in comparison with other systems. The number of trains running in the one direction under the permissive staff system is controlled by the number of tickets and ticket staff. For instance, if instruments were made to contain six tickets, seven consecutive trains could run in the one direction, six of the trains using each one ticket, and the last train taking the ticket staff.

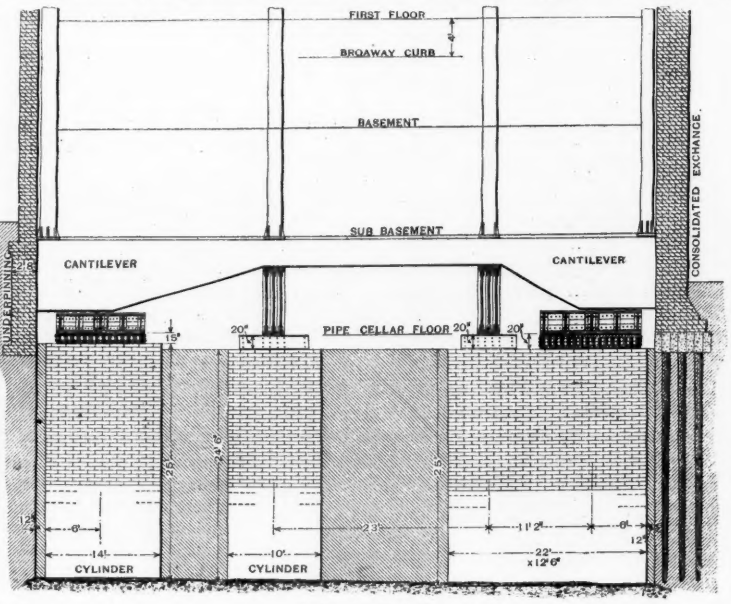
T. H. PATENALL.

Substructure of the Manhattan Life Insurance Building, New York City.

The Manhattan Life Insurance Company's new office building is to be the highest office building in the world and one of the heaviest structures in New York City.



Section W-X of Fig. 2.



Section Y-Z of Fig. 2.

Fig. 1.

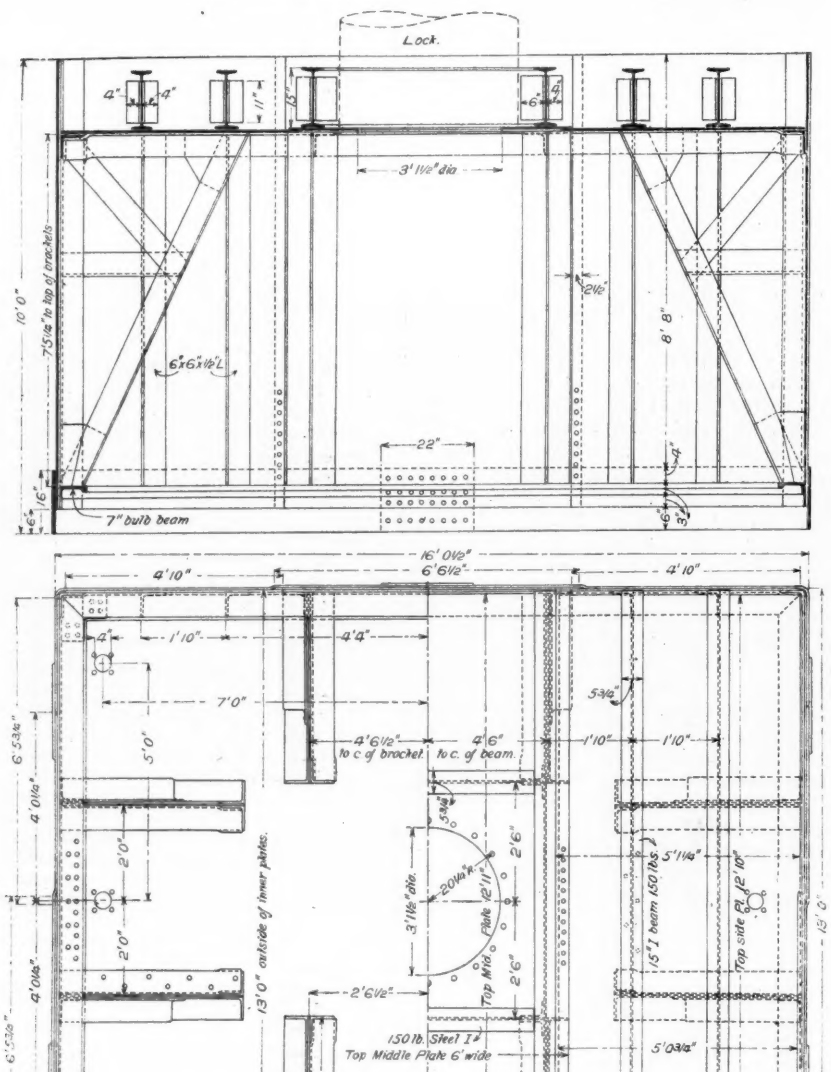


Fig. 3—Section U-V of Fig. 2.

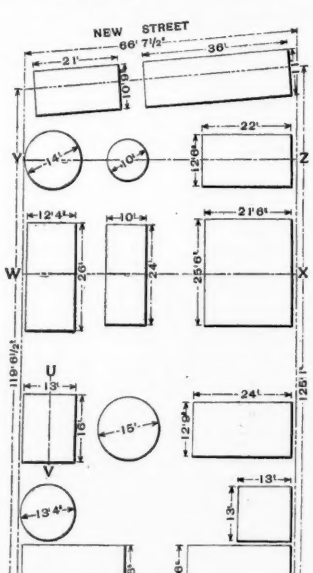


Fig. 2.

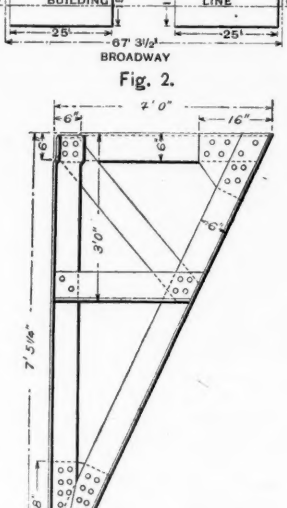


Fig 4.

SUBSTRUCTURE OF MANHATTAN LIFE INSURANCE BUILDING.

It will be 16 stories in height, surmounted with a tower and dome, the top of which will be 61 ft. above the spire of Trinity Church, which is nearly opposite. The foot of the flag staff on the top of the tower will be 347.5 ft. above the Broadway sidewalk and 408 ft. above the foundations of the structure. The top of the main roof will be 242 ft. above Broadway and 253 ft. above New street. The site of the building is 67.3 ft. on Broadway × 119.6 ft. on the north side × 125.1 ft. on the south side. The frame is of structural iron on four rows of iron columns extending the length of the lot; the sides are filled in with brick; the Broadway front is of light colored limestone from Bedford, Ind., while the New street front is of brick and terra cotta of special color and manufacture. The architecture is Italian Renaissance, ornamented from basement to attic. A comparison of the height of this building with certain others may be made from the following table:

Auditorium, Chicago	270 ft.
Trinity Church, New York	286 ft.
World Building, New York	286 ft.
Masonic Temple, Chicago	302 ft.
Cathedral of New York	325 ft.
St. Peter's, Rome	337 ft.
Manhattan Life Insurance, New York	348 ft.
St. Paul's, London	365 ft.
Cathedral at Florence	384 ft.
Cathedral at Milan	438 ft.
Washington Monument	555 ft.

The height to which buildings can be erected is almost unlimited so far as the superstructure itself is concerned. What limits the height of buildings is the foundation. The remarkable height of this building has drawn to it a great deal of attention from architects and engineers in this country and in Europe, and especially to the foundations. The difficulties attendant necessitated some other type of foundations than that usually employed for structures in New York. The other tall buildings in the vicinity are on piles, but the requirements of the statute laws of New York are such that if this lot had been literally driven full of piles it would have exceeded the maximum pressure per sq. in fixed for pile foundations. It therefore became necessary to adopt some other form of substructure or to go to bed rock and the latter undertaking was approved. It was impossible to make excavations owing to the presence of water and the treacherous nature of the underlying material and the enormous weight of the buildings adjacent. On the south side of the building and extending close up to the lot line, is the Consolidated Exchange Building, six stories in height, on pile foundations, which piles are supposed to have been driven down to the substratum of rock. On the north side is a four-story brick building with foundations set in the earth at about 26 ft. below the Broadway curb line. These heavy buildings adjoining precluded the idea of excavating in the ordinary way down to bedrock, even if the water could have been cared for. It was therefore decided to use pneumatic caissons after the manner very common in bridgework, and to sink the foundations to bedrock. The underlying rock at this point is about 54 ft. below the level of the Broadway curb or 32 ft. below the cellar excavation, *i. e.*, water level. This plan was not adopted without some misgivings, for it had never been used before for buildings, and its effect upon the adjacent buildings could not be predicted. Extreme caution had to be exercised and the adjoining structures watched. Moreover, the cramped space in which the work had to be carried on and the crowded streets were annoying features of the undertaking.

The accompanying plan, fig. 2, shows the placing of the caissons for the building. What at once strikes the attention is the irregularity in placing the caissons and the varied shapes and sizes adopted. The reason is that the ultimate weight upon concrete, permissible by the laws of the state, is 150 lbs. to the square inch, and the caisson piers are so placed, and are of such size as to have the maximum pressure allowable distributed over the cross-sectional area of each. It is cheaper to construct a cylindrical caisson, and therefore where there was sufficient space a cylindrical caisson has been put in; but when the space was limited, as in the front and rear of the building, rectangular or square caissons had to be employed in order to secure greater bearing surface, that the maximum pressure should not be exceeded. The most advantageous plan called for 15 separate caissons, the largest being 21.5 × 25.5 ft. and the smallest 10 ft. in diameter, so placed as to best bear the load imposed upon them.

The small caissons were built at the shop, but the larger ones were brought on the ground in sections and erected in their proper positions. Fig. 5 shows caisson loaded on a truck ready for transportation to the lot.

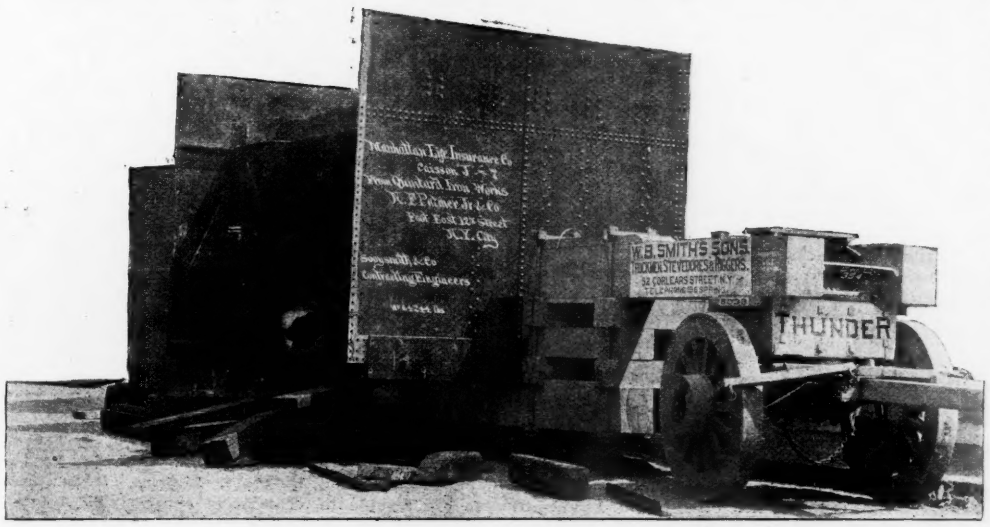


Fig. 5.—Transporting a Caisson.

The construction of the caissons was briefly described in our issue of March 17, 1893, p. 206. Fig. 3 shows one of the rectangular caissons, and it is typical of all. It is made of steel plates, angles and beams. The sides are of ⅛-in. steel, from 11 to 13 ft. high, stiffened with angle brackets made of 6 × 6 angles (fig. 4), and further strengthened by 7-in. steel bulbs placed horizontally between the brackets. The roof is of ⅜ plates, covered with steel I-beams, which support the loads of masonry during the sinking of the caissons. The sides are carried a few inches below the bulbs and the foot of the brackets, and are re-enforced by heavy steel plates, 16 in. wide and ⅛ in. thick, which are riveted to the outer shell of the caisson with ⅞ countersunk rivets. This plate is the cutting edge of the caisson. These ⅞-in. plates, riveted at the bottom of the caisson, gave them a sharp and unobstructed cutting edge, which was forced well ahead into the material, and, aided by the air pressure, prevented all flow of the surrounding material into the caisson and the consequent settling of adjoining buildings. The caisson is provided with a shaft 4 ft. in diameter, and an air lock for the passage of men in and out, and also as a means for filling the chamber with concrete after the caisson has been sunk. Air was supplied by 4-in. pipes through the roof of the caisson. Fig. 6 shows a general view of the lot while the caissons were being built and sunk. In the foreground, at the left, will be seen a rectangular caisson in process of construction, and in the background masons are engaged in building the brick pier upon one that is being sunk. The walls of the adjoining buildings are shored up as an extra precaution against settling. In order to facilitate work on the caissons, bolts were largely used in preference to rivets for connecting the larger members. Each caisson was well caulked, the roof beam, shafting and pipes were placed and the brickwork then begun. When the brickwork was 6 to 8 ft. in height excavation was begun inside the caisson.

The material was of fine sand, with considerable mud mixed in, flowing readily. It was removed from the caisson by shoveling it to the mouth of a 4-in. pipe, which extended through the roof and super-imposed brickwork. In this pipe was a valve giving a full 4-in. opening. The mud and sand were puddled at the end of this pipe, and as soon as the valve was opened the air pressure inside the chamber forced the material up through the pipe and out the caisson into the open lot, from whence it was removed by carts.

All of the caissons with the exception of the three small ones in the middle of the lot were sunk within one foot of the walls of the adjoining buildings and this close working, to the depth of 34 ft., in such a loose material required extraordinary care that there should be no drawing in of material and serious results from settlement of the adjoining buildings. The great pressure caused by the enormous weight of these buildings upon the outside of the lot had a tendency to force in and deflect the caissons while sinking. This difficulty was met by excavating on the inner side and loading the caissons unequally. The shifting was remedied in the one case and precautions taken to prevent it in the others. As the excavations continued the brick work was built upon the top which continued to force the caisson down to a greater depth.

No serious injury was done to the adjoining structures or their foundations. The sinking of the foundations of this new building to bed rock has no doubt increased the stability of those adjacent to it, for the underlying material is confined and supported by the brick piers going to bed rock.

No boulders or rocks were met and no blasting had to be done inside the caissons until bed rock was met, when it became necessary to level the surface of the underlying stratum, which is of gneiss. There were no cases of caisson disease and no one was injured seriously. Much of this may be attributed to low pressure and to extraordinary care on the part of the contractor. The success of the work justifies the use of the process, for it was quickly completed and in a manner satisfactory to the architects and builders.

When the caisson reached bed rock the latter was leveled and cleaned and the working chamber and shaft then rammed full of concrete, composed of one part Alsen's Portland cement, two parts sand and four parts broken stone. The brick were good hard burned Hudson River brick laid in cement mortar of one part Little Giant cement to two parts of sand. The quantities of masonry in the substructure amounted to 1,262 cu. yds. of concrete and 3,334 cu. yds. of brick work; and the average depth of foundations was 32 ft. The first caisson was delivered on the lot April 13, and the work was completed Aug. 13, 1893, which makes the average time for the sinking and completion of each foundation only eight days. The building entire is to be completed by June, 1894.

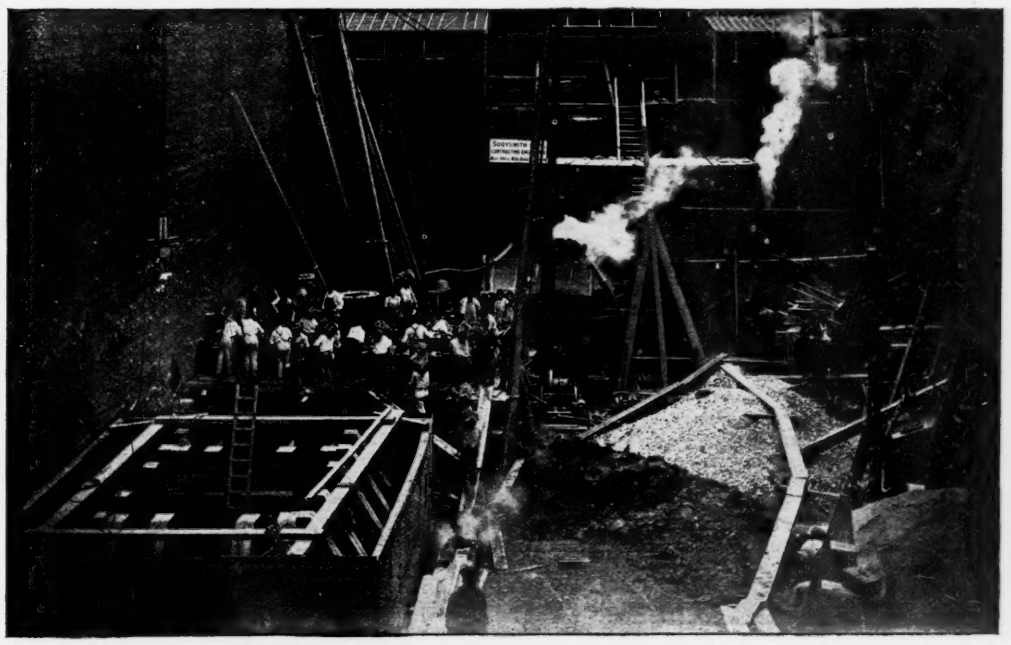


Fig. 6.—Caisson Foundations.

An item of special interest connected with this work is its cost. As compared with the total cost of the building it was very cheap, probably under 10 per cent., and the total cost can fairly be estimated under $150,000. Numerous inquiries from other parties who are contemplating the construction of very high buildings have been made, and this method of building founda-

tions bids fair to become popular for very high buildings, the success with which it may be undertaken having been fully demonstrated. No comparison can be made between the expense of such foundations and those of Chicago, as the Chicago foundations as built would not support the Manhattan building. The cost of course, is greater as they are run to greater depth, and equally require a large amount of iron and steel beams or rails to distribute the weight of the buildings over the several piers. This distribution of weight by the beams and girders is well shown in fig. 1., which shows the top of the brick piers literally covered with eye beams, separated by distance blocks, and bolted through and through with bolts. Upon these beams are placed cantilevers and girders which support the four rows of columns, which carry the loads to the piers and thus effect a perfect distribution to each pier in proportion to its size and strength. In fig. 1. these columns are shown as coming directly over the piers, but a study of the plan, fig. 2, will show that this may not always be the case if the rows are straight and regularly placed—*e. g.*, the front and rear ends of the lot. The illustration shows very clearly the arrangement, sizes and dimensions of these beams and cantilevers, together with the heights of the basement floors with regard to the Broadway curb.

The architects of this magnificent building are Messrs. Kimball & Thompson, of New York City, who are personally superintending its construction; the contractors for the sub-structure are the well known firm of contracting engineers, Sooysmith & Co.

Expansion Bearings for Bridge Superstructures.*

Among the special details of bridge construction one of the most important is the provision for changes of length due to temperature. The older devices for this purpose were of three classes—sliding plates, rockers and rollers.

The sliding plate was the simplest of all. It consisted simply of a smooth-planed surface of metal on the masonry, and a like surface at the bottom of the end post, one sliding on the other. So long as the plates could be kept lubricated this worked pretty well; the difficulty in lubricating, however, was often fatal, and though there are instances of important bridges, of spans of considerable length (like the deck spans of the Louisville Bridge), which have done good service with sliding plate bearings, the practice has not met with favor. Sliding plates, however, are generally used under riveted structures of moderate length.

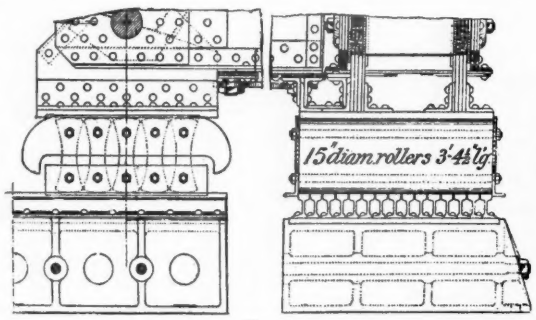


Fig. 1.

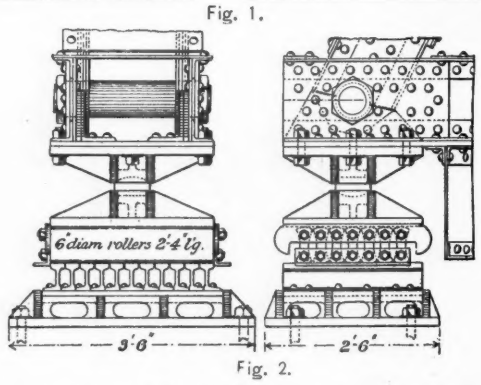


Fig. 2.

Rockers are an attractive design, and have some advantages over other plans, but there are two objections the great weight that must be carried on the axle, and the friction on this axle. The friction causes more or less sliding motion; the result of this sliding motion is to work the bearing gradually toward one edge of the section, so that at length the rocker falls over. Rockers were used considerably 25 years ago; they are now almost entirely abandoned.

Rollers have always been the favorite device. It is the one arrangement in which friction can virtually be eliminated. If perfectly constructed the arrangement must always be perfect. Such has not proved to be the fact, and in many instances the motion on the rollers is less than on the sliding plates.

As rollers ought theoretically to give perfect expansion, and fail to do so, it follows that the defects are not in the principle, but in the details of design and manufacture. The problem for the engineer is to devise a form of rollers which will always roll.

The function which an expansion joint has to perform is to transfer the weight of a superstructure whose length changes, to a fixed substructure, without exerting on that substructure any other than a purely vertical strain. The older style of rollers failed to meet these conditions and failed to roll; a study of the older rollers will show why they failed.

In the old roller bearings there was no provision except accuracy of workmanship to insure parallelism of the two plates, and even the slight deflection of the truss due to the passage of a train would disturb this parallelism; the necessary result was that some of the rollers were greatly overburdened. In the older bridges the arrangement of rollers had the serious effect of putting the rollers where they could not be kept clean. A better practice, which was used by Mr. C. Shaler Smith and some other good designers, was to cut a series of parallel grooves in the flat surface of the lower casting; these grooves permitted of cleaning the rollers, and served as dust traps, from which the dust would either blow out or could be removed. It was a step in the right direction, and it is to be regretted that it has not been more generally followed.

The practice which followed this, and which is still in common use among the majority of American bridge builders, places on the masonry a comparatively thin plate of wrought iron or steel, the top surface of which is planed, and on which two angle irons are riveted, which serve as guides for the rollers. The rollers are seldom more than 3 in. in diameter, and are turned with short journals at the ends, while side plates fitted over the journals keep the rollers parallel, a stiff angle iron frame being sometimes substituted for the plates. Above the rollers is the top bearing, which is the under side of the bolster, and is fitted with guide angles in the same way as the bottom plate. It is impossible to get at the rollers to keep them clean; the guide angles of the top and bottom plates make a box which becomes filled with dirt, while the rollers are so small that comparatively little obstruction locks them fast. Unless unusual care is taken to secure a proper bearing between the lower plate and the masonry, this thin plate will become indented so that there is a groove under each roller. Bearings of this kind are often found to be completely immovable.

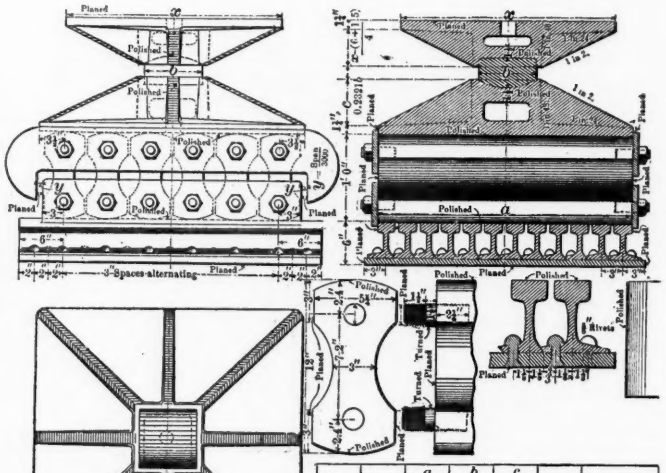
The friction of these small rollers is considerable; if everything were clean it would not be large, but as soon as dirt begins to collect around the rollers friction increases rapidly. The rollers do not always keep in their true position; the side plates of the frames keep them parallel to each other and at equal distances; but the whole nest of rollers will often be found to be badly sleud; sometimes the whole nest moves, keeping its proper shape, but more often the guides prevent this, the rollers move individually and the nest ceases to be rectangular.

The European practice has generally been much better than the American practice; the rollers used have been of larger diameter, and they have been supported on wall plates of greater thickness. The use of large rollers has led to the adoption of segmental rollers, the sides of the rollers being planed off so that they could be put closer together and still as much cylindrical surface as was actually needed for the prescribed motion retained. These segmental rollers are sometimes so designed that they will shut into each other as they roll, but in many cases the sides are simply planed off flat. In Germany they are termed stilts and their use has become very general.

There seems to be only one valid objection to the use of segmental rollers, and that is that if moved further than is intended they will tip over and it will be very difficult to restore them to position. With very heavy piers this condition is not likely to occur, but in this country, where light piers are sometimes deflected by ice (which can be done without serious injury to the masonry), such a thing might not be infrequent. This accident has occurred in Germany, and methods of preventing this overturning have been adopted; they would be doubly necessary here. One method has been to provide the ends of one roller with teeth, which teeth mesh into gears in the top and bottom plates; another method is to make the rollers of such shape that they cannot tip over, but will support each other before they fall.

In 1879, in preparing the plans of the bridge across the Missouri River at Plattsmouth, Neb., I used the usual form of rollers running between planed plates, both plates and rollers being of steel, the rollers having grooves cut at the center, and both top and bottom plates having guide ribs on them. The lower plate, instead of resting on the masonry, was supported on a heavy wall-plate of cast iron. The rollers had the usual journals at the ends, and were kept equally spaced by side plates, which were held together by cross rods with nuts at the end. In order to exclude dirt a piece of rubber belting was placed between the side plates and the rollers, so that when the cross-rods were screwed up tight the rubber would form a gasket pressing against both top and bottom plates, the two rubber gaskets, with the two end rollers, forming a box, which was expected to exclude dirt from within. By removing the nuts at the ends of the rods the side plates and gasket could be taken off and everything could be cleaned. The arrangement was not wholly satisfactory; the rubber failed to exclude dust, and after a time was removed entirely; the rollers ars now kept clean by occasionally removing the side plates and cleaning them out with a brush. While they work better than rollers generally do, the arrangement is far from perfect.

Two years later, in building the bridge across the Missouri River at Bismarck, N. D., the spans of which are the same length as those at Plattsmouth, I used the same rollers and the same bearing plate on top, this bearing plate being in both instances the under side of the bolster, but substituted, for the flat plate under the rollers, a composite plate made of T-rails riveted to a plate below, this plate resting on a large wall-plate casting. One flange of each T-rail was planed to a bevel edge and the other flange planed almost entirely away, the arrangement being such that the flange, when riveted down, held down the side of the adjoining rail; when the whole was riveted up the top was planed off, the center rail being left high, so as to form a guide rib. This gave a very rigid bearing plate, and also one which can easily be cleaned. The dust naturally drops in between the rails, and if it ever becomes necessary to clean the bearing by working a brush parallel to the rollers, the dirt has to be brushed only as far as the opening between two adjourning rails. I have used this form of bearing plate almost invariably since that time, and made no further change in the general arrangement until 1890.



No. Rollers	No. Rails	a Length of Rollers Inches	b Side of Rocker Plate Ins.	c a-(b+1.5) / 4 Inches	Total Bearing Inches	Safe load @ 2000lbs.p.lin.in Pounds
3	6	17.5	4	3.00	45	135,000
4	8	23.5	5	4.25	80	240,000
5	10	29.5	6	5.50	125	375,000
6	12	35.5	8	6.50	180	540,000
7	14	41.5	9	7.75	245	735,000
8	16	47.5	10	9.00	320	960,000
9	18	53.5	11	10.25	405	1215,000
10	20	59.5	12	11.50	500	1500,000
11	22	65.5	13	12.75	605	1815,000
12	24	71.5	14	14.00	720	2160,000

Fig 3.

The construction of the bridge across the Mississippi River at Memphis, Tenn., presented a problem which called for a special solution. The central span of this bridge is 621 ft. long, and as a cantilever arm projects from each end of this span the weight carried at each end corresponds to nearly double the weight of the half span. Making no allowances for changes of length due to strains, the provision for temperature alone required a possible movement of about 8 in., while the actual dead weight carried on each bearing was 2,454,000 lbs., and the total dead and live load 4,036,000 lbs. In other words, I had to prepare an expansion bearing with a possible movement of nearly 10 in., which should roll freely under a weight of 2,000 tons. This is probably the largest expansion bearing ever built. As the piers were tall and slender it seemed necessary to reduce the friction on this bearing as much as possible, and I decided to use large segmental rollers. [For illustrations and description see *Railroad Gazette* of Sept. 8, 1893.]

The result of this arrangement has been satisfactory. The bearing is sensitive to all changes of length, it forms an accurate metallic thermometer 620 ft. long, and the movements due to the passage of trains and the changes of chord lengths under strains are accurately measured.

The arrangement as worked out proved so satisfactory that I determined to use the same kind of rollers on the bridge over the Mississippi River which I was then building at Burlington, Ia. This bridge contains

* Extracts from a paper by Mr. George S. Morison, read at the New York meeting of the American Society of Mechanical Engineers, Dec. 1893.

six double track spans, each 246 ft. long. The details of the expansion bearings were made precisely like those I had used on other bridges, except that I used large segmental rollers with angle iron side plates with square ends below, and flat hook plates above. The side plates projecting above and below the top and bottom bearing plates were made to serve as guides. This bearing is shown in fig. 1. Each bearing contains 5 rollers precisely like the 30 rollers at Memphis.

Observations on these bearings showed that some further changes could be adopted to advantage. The cast iron wall-plates and the rail-plates were all that could be desired; the large segmental rollers with the hook side-plates were good, but could be improved; the pin connection between the bolster and the truss was good as far as it went, but was defective, in that it provided for rocking in one direction only, whereas irregularities of workmanship or other disturbances might destroy the parallelism between the pin and the rollers, and thus make very unequal bearings.

To remedy this last defect I decided to make the rocking of the bearing entirely independent of any of the pin connections in the truss, and to put below the chord line of the truss what I have termed a rocker plate, which is a polished steel plate with two cylindrical surfaces on top and bottom at right angles to each other. The plate bearing on the rollers is a steel casting, with a turned socket in the center, in which the rocker plate fits, and above the rocker plate is another steel casting with a turned socket below. The upper casting is, therefore, free to rock in any direction without disturbing the lower casting.

The first bridge in which this device was used was the viaduct which carries Mound street across the yard of the St. Louis, Keokuk & Northwestern Railroad, in the city of St. Louis. This viaduct consists of a single span of 293 ft. The expansion bearing is shown in fig. 2. The rollers were 6 in. in diameter and spaced $2\frac{13}{16}$ in. between centers, being much smaller than those used before; in other respects they were similar to the Memphis rollers. The steel castings with the intervening rocker plate come above the rollers.

The operation of this expansion joint has been satisfactory, but the rollers seemed smaller than it was expedient to use, and further reflection led to the conclusion that there was no good reason why, within reasonable limits, rollers of uniform size should not be used for all lengths of span, the variations being made in the length and number of the rollers; as a result of this, I worked out a standard expansion bearing which I now use for all bridges under which it seems expedient to place rollers. This expansion bearing is given in fig. 3. It consists of a rail plate similar to those already described, except that the entire top surface is planed off to a uniform level, without any guide strip; under this rail plate would be the usual iron casting, which, however, is not shown on the plan.

The rollers are made 12 in. diameter and placed 6 in. between centers, those dimesions being kept constant for all conditions. The section of the rollers has been slightly changed, the sides near the top and bottom being kept parallel, so that instead of shutting into each other, the rollers will strike before turning over, while a hollow is left in each face for working a brush.

Stud bolts screwed into the ends have been substituted for the long rods passing through holes drilled the whole length of the rollers. The side plates are held by these stud bolts, the lower plate being made square and the upper plate with hook ends. There is thus a double provision against tipping over—the shape of the rollers, and the hook plates. Above the rollers comes the top bearing, which is a steel casting carrying the rocker plate which carries the top plate. The lower side plates project below the rollers, and the upper side plates project above the rollers, so that they form guides to keep the rollers in line, taking the place of the guide ribs used in the older bridges.

The bolster or the bottom chord is placed on the top plate, to which it is bolted rigidly. A rocking motion is possible in any direction, and the bearing may be depended on to distribute the weight not only uniformly over the several rollers, but uniformly over the length of each roller.

While not a necessary feature of the design, I have thought it best to make the lengths of the rollers always of multiples of 6 in., so that with two rollers we should have practically a bearing 12 in. sq., with three rollers a bearing 18 in. sq., etc. I have used this bearing with four rollers under each of the three spans of the new Wabash River bridge on the Ohio & Mississippi Railway. I am using it with 10 rollers under the 440 ft. double-track spans across the Missouri River at Bellefontaine Bluffs; with six rollers under the 210 ft. double track spans, and with nine rollers under the 360 ft. double-track spans of the bridge across the Mississippi River at Alton, Ill.; and with six rollers under the 330 ft. single-track spans of the bridge across the Missouri River at Leavenworth, Kan.

It is possible that, instead of a square bearing plate with two cylindrical surfaces of equal radii (my practice being to make this radius equal to the side of the plate), it would be better to use an oblong plate with different radii at bottom and top, but the only advantage of this would be that it would reduce the bending strain on the steel castings. Except for this I do not think of any desirable improvement.

It may be objected that this rocker plate arrangement, which allows a motion in both directions, deprives the end post of a bridge of the transverse rigidity which is due to the usual square bearings. This objection is undoubtedly well taken, and the end posts must either be made stiff enough to resist lateral strains without the aid of square ends, or the two end posts should be rigidly connected by a floor beam or cross frame at the bottom. This latter I regard as the best practice, and think that it should always be followed in all important structures. The rigid connection, however, ought not to be made until the entire structure is completed and swung, so that the rocker plates have been free to move and so distribute the weights equally on the bearing below; after this has once occurred, irregularities of workmanship will be so largely taken out that any subsequent motion will be too small to be disturbed materially by the stiff connections above.

Contrary to my usual practice, I have patented this arrangement, the patent being dated Oct. 25, 1892. The patent, however, was taken more for purposes of protection than with the expectation of deriving any revenue from it, and all bridge builders, railroads and other parties desiring to use this form of bearing may have the privilege of doing so on the payment of a very small royalty.

THE LOAD ON ROLLERS.

The American practice has generally been to make the permissible weight per lineal inch of the roller proportional to the square root of the diameter of the roller A common provision in specifications limits the weight in pounds to 500 $\sqrt{d}$, d being the diameter of the roller. This rule is based on the theory that there is a permissible limit of indentation which the roller may be allowed to make in the rolling surface, which permissible indentation is supposed not to exceed the elastic limit. If the versed sine of the indentation is constant, the chord of the same indentation will vary as the square root of the radius of the circle; and as the permissible weight is supposed to be a constant of the chord of indentation, which chord varies as the square root of the radius or diameter, the strain is determined accordingly.

While mathematically correct, this rule seems to me based on an incorrect conception of the function of rollers. There is no special reason why the strains either on the surface of the rollers or on the bearing surface should be kept within the elastic limit; on the other hand, it would be better to have them exceed the elastic limit if the result of such excess was to reduce the surfaces both of the rollers and the bearing plates to the condition of the surface of cold rolled iron. The only necessary limit is that the elastic limit must not be so great y exceeded that the metal under the surface will flow and the roller become permanently deformed, as has occurred in conical roller bearings under turn. table centers.

On the other hand, the same absolute indentation which would lock a small roller so that it would lie stationary in a groove might do little harm to a large roller. If we assume the roller to be set in a groove, we have forces applied on a bent lever tending to lift that roller out of the groove, the vertical arm of the bent lever being the radius of the roller, and the horizontal arm half the width of the groove. So long as the width and depth of the groove are kept proportionate to the radius or diameter of the roller, the force required to roll the roller out of the groove will be constant. In other words, the formula which will maintain for all sizes of rollers a constant freedom of motion would make the strains on those rollers proportional to their diameters.

In Germany this rule has been followed, and while there has been a considerable variation in the unit strain allowed, the fact has been accepted that the weight placed on a roller should vary directly as the diameter of the roller.

The American rule is not only incorrect in principle but vicious in its results. It encourages small instead of large rollers, a 12-in. roller, for example, being allowed to carry only twice the weight that would be put on a 3 in. roller, so that the smaller the diameter of the rollers the greater the weight which would be permitted on the same area of bearing surface.

In proportioning expansion rollers, I have adopted a somewhat arbitrary basis, accepting 500 $\sqrt{d}$ as correct for a 4-in. roller, thus making the weight permissible per lineal inch 1,000 lbs. for a roller 4 in. in diameter Instead of varying the weight with the square root, I vary it with the diameter; this makes the permissible weight 250 lbs. per lineal inch on a 1-in. roller, and 3,000 lbs. per lineal inch on a 12-in. roller. The table of weights allowed on bearings of different sizes, which is shown with fig. 3, has been calculated on this basis.

Handling Grain at Odessa.

The growth of the port of Odessa, on the Black Sea, is a conspicuous indication of the progress which is silently transforming all of Southern Russia. A hundred years ago, Odessa was only a Tartar village, dominated by a Turkish citadel; it has now become one of the most important centers of the world's commerce in grains. The quantity in store at this port at the end of the year 1888, when there had been for a time an ice blockade, amounted to 500,000 tons, or, say, about 20,000,000 bushels of 60 pounds.

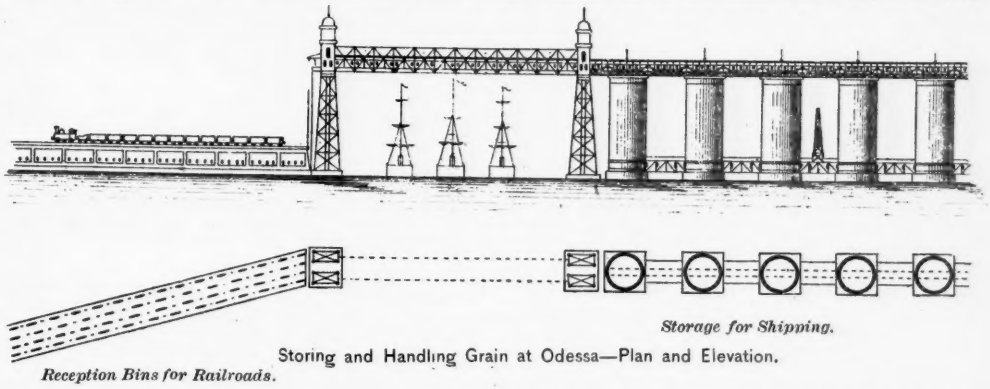
An extract from the table of annual exports will show past development and afford a basis for a calculation of future growth. Beginning with 1836 when the shipments amounted to 5,300,000 bushels; in 1853 they reached 16,000,000; in 1871, 28,000,000; in 1885, 44,000,000; and in 1888 they were 66,6C0,000 bushels, or 2,000,000 tons.

This great movement and the consequent necessity for greater storage capacity at the port has caused the engineering contractor, G. Luther, of Brunswick, Germany, who had previously been employed in building warehouses at other neighboring ports, to make a study for the enlargement or the development of the conveniences for the storage and shipment of grain at Odessa, which he has published, and of which, as the scheme is quite original, it is proposed to give a brief account.

The harbor of Odessa is artificial, the only protection from the violence of the waves being an extensive breakwater on the northern side of the basin, with a curved pier or mole at the eastern entrance, extending from beyond the breakwater to the shore. At the western end of the breakwater there is another opening for the entrance of vessels, about 100 meters (327 ft.) in width, which it is thought important to preserve. The project of Mr. Luther would utilize the already constructed breakwater as a foundation upon which to erect grain warehouses or elevators, which would be reached by boats from the rivers for unloading and by larger vessels to take in cargo. The approach by rail from the western end of the harbor to these elevators must necessarily be over an elevated structure which must end at the edge of the western opening of the harbor; and this structure is to be occupied beneath the tracks by reservoirs for the reception of grain which reaches the port by railroads.

In order to speedily and cheaply transfer this grain to the warehouses upon the breakwater, the western opening for vessels is to be bridged at the necessary height to clear all masts, say 150 ft., and the grain is to be carried upon belts from the bins beneath the rails to the foot of the pier at the western end of this bridge, where elevators attached to the pier will raise the grain to other belts which will convey it upon the bridge across the entrance to the harbor and deposit it in any of the bins of the warehouses upon the breakwater. These will consist of circular towers or bins of 50 meters in height and 15 meters diameter, surmounted by a gallery in which will run the distributing belts by which the grain is to be conveyed. These bins will be placed 14 meters apart, and may be united by the subsequent construction of smaller bins between them when the increase of traffic shall require.

This structure is carried upon vaulting, affording space beneath the bins for discharging them, and for conveyors by which the grain may be shifted from one bin or granary to another. It is proposed to erect 36 of such bins at first, although any less number may be decided upon. These bins will be built upon the "Monier system," in which the walls of beton lined with stone are strengthened by a skeleton of hoops of round iron laid in the concrete. The machinery of the elevators and conveyors is to be operated by electricity from a plant erected as near to them as conveniently may be. Mr. Luther suggests that it would be an improvement upon this scheme, but more costly, to build the granaries upon a foundation parallel with and inside of the breakwater, leaving a canal for the use of small vessels between the granaries and the breakwater, and so providing a double length of room for ships along the line of warehouses.



Storing and Handling Grain at Odessa—Plan and Elevation.

Plain and Vortex Blast Pipes.

On page 209 of this volume we had something to say about the vortex blast pipe. Following up the line of argument there presented, we now give illustrations of a type of exhaust pipe known as the "Adams Vortex" pipe. The form of pipe most used in this country is the Smith. It is used quite extensively on the Reading road, and from it there are good reports. It has recently been put in service on the Central Railroad of New Jersey. Fig. 2 shows the Adams vortex exhaust as used on the London & South Western Railway in England. Fig. 2 shows the vortex pipe as used on the Caledonian Railway. It is noticeable that the deflector plates and smokebox netting, so noticeable in American practice, are not used in the smokebox with the vortex pipes. A good example of the single exhaust pipe used in America is shown in fig. 3, which illustrates the exhaust pipe and smokebox arrangement used on the East Tennessee, Virginia & Georgia Railway. The diameter of this exhaust tip, 5¾ in., is greater than the average used in America.

The construction of the Adams vortex pipe is clearly shown from the drawings. In the vortex pipe the annular exhaust takes gases through the center of the pipe as well as around the outside column of the exhaust. Thus the air is extracted from the smokebox at the top by reason of the exhaust discharging into the base of the stack, and also from the bottom by reason of the annular opening. From the lower part of the smokebox the gases are taken through the opening *A*. This is probably all that is necessary to say about the operation of the vortex pipe as the drawings clearly show the construction, and the action is very simple.

The vortex exhaust pipes have been much talked of and written about, and not a few who have tried them have said that they produce advantageous results; but so far no one has taken the trouble to investigate and give to the public the facts concerning their operation. No one appears to know just how much in quantity and what is the kind of effect produced in a smokebox by these peculiar exhaust arrangements. It is clear to see, however, that there is some truth in the claims of their promoters, but how much the claims amount to in point of fact is not known. There is no doubt that the Adams vortex pipe produces an upward draft through the central discharge at *A* and, by distributing the draft more evenly over the tubes, has a beneficial effect in a smokebox where there is no deflector plate. It is also true that with the Smith blast pipe, something like a vacuum is produced in the offset cylinder when one cylinder exhausts. So much has been claimed for vortex exhaust pipes without proof, that it now becomes necessary for the promoters of these devices to make some accurate experiments to learn just what is the vacuum produced with the two kinds of exhaust pipes, and to show that there is some real advantage in using them.

Less is known about the proper arrangement of locomotive exhausts than of any other important detail of locomotive construction. No better proof of this is wanted than is found in the wide variety of designs. Some roads use smokestacks 12 in. in diameter on all classes of engines regardless of the size. Other roads have special stacks for each type of engine. One will find a 3½-in. exhaust nozzle on 18-in. cylinders on one road, and 5-in. exhaust nozzles on the same size cylinder on engines doing the same class of work on another road. Such investigations as have been made by the Master Mechanics' Association have never been anywhere near final. The experiments were non-conclusive and incomplete. In Chicago, the engines on the Alley elevated, with compound cylinders 9 and 15 × 22, are running with a 4-in. exhaust nozzle, while there are many engines on surface roads with 18-in. cylinders running with 3½-in. exhaust nozzles. It cannot be that the practice in both cases is correct, and it will appear that the larger engines running with the smaller exhaust nozzles have badly arranged smokeboxes. It is not uncommon to find by looking into the smokebox of locomotives, when the engine is in operation, the exhaust steam passing clear through the stack without touching the sides, and in other cases to find the exhaust striking the inside of the smokestack base and being deflected back into the smokebox.

Two roads started some time ago to make an investigation of the effect of various smokebox arrangements, but the experiments were not carried to completion; and to-day one cannot say what relation there should be between the diameter of the nozzle, the diameter of the smokestack, the distance between the nozzle and the base of the smokestack and the length of the smokestack. It is not known whether a taper or a straight stack is better. Each individual designer may have a conviction in the matter, but the confliction of prevailing ideas is too great to give much confidence in the opinions of anybody on this subject. In two cases within a year special designs of locomotives built by our best builders have been sent out for comparative tests and were put in the best condition so far as the builders knew, but in both cases the smokestack and exhaust arrangements were so faulty they had to be changed several times. The changes in both cases were made after experiment, and it was clearly evident that the builders did not know how to design an exhaust arrangement to do really good work. One would suppose that promoters of patent exhaust apparatus would have enough insight into the matter to test locomotives with vacuum gages and with different diameters of stacks to show conclusively the advantage of their devices. The time has long since passed when theory about exhaust apparatus amounts to anything. What is wanted now is accurate scientific record of the effects of different designs and dimensions, and before any progress can be made it will be necessary to take up scientific experiments with different types of exhausts.

American Society of Mechanical Engineers.

The autumn meeting of the American Society of Mechanical Engineers began at its house in New York last Monday night with the annual address of the President, Mr. Eckley B. Coxe, which was a professional paper on the Uses of the Finer Grades of Coal for the Generation of Steam. This paper was illustrated by lantern views, showing the laboratory arrangements and apparatus for the sizing, sampling and analysis of coal. An abstract is given in this issue.

The business session of the annual meeting was held next morning (Dec. 5). Reports of the Council and Finance Committee were received. The tellers of election reported the election of officers as follows:

President, Eckley B. Coxe.
Vice-Presidents, C. E. Billings, Percival Roberts, Jr., H. J. Small.
Treasurer, William H. Wiley.
Managers, John B. Herreshoff, L. B. Miller, W. S. Russell.

The first professional paper read was on the Buckeye Engine and Valve Gear, by Mr. A. K. Mansfield, which drew out some discussion, but the next paper occupied the remainder of the forenoon in its presentation and discussion.

This was by Prof. R. H. Thurston, on the Maximum Contemporary Economy of the High-Pressure Triple Expansion Engine. This paper was a report of tests of a high-pressure, triple expansion pumping engine, manufactured by The E. P. Allis Company, of Milwaukee, and a comparison of its efficiency with an ideal engine under the same conditions. This provoked a good deal of criticism and considerable doubt as to the correctness of the tests, Mr. Ball, Mr. Rockwood, Mr. Shepard and Professor Denton taking an active part.

Mr. Ball criticised the combining of the indicator diagrams and presented a method of his own by which he combines them by the compression curve, and showed that they gave a more uniform area. Mr. Rockway questioned the accuracy of the figures for feed water and undertook to point out the error in the test which gave such high results. He also made an argument for two cylinder compound engines as against multiple expansion types. Mr. Shepard criticised the tables on page 38 of the paper as being very misleading, and incorrect. Professor Denton discussed the slow

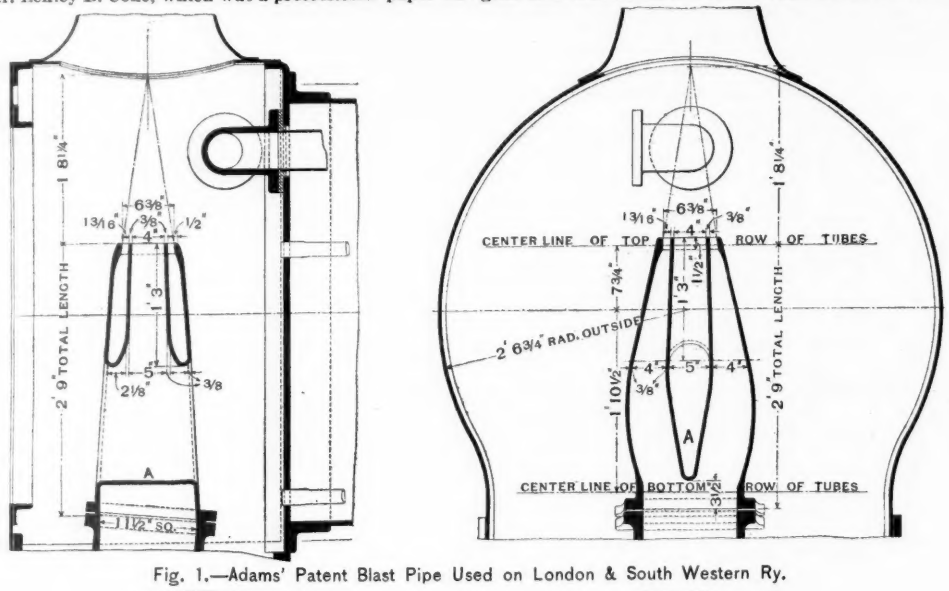


Fig. 1.—Adams' Patent Blast Pipe Used on London & South Western Ry.

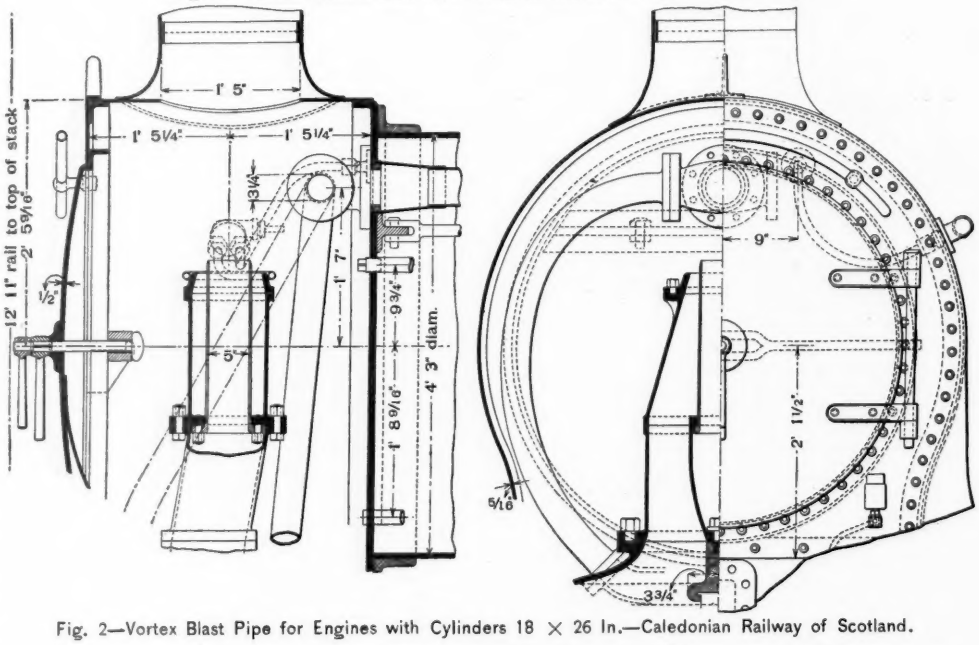


Fig. 2—Vortex Blast Pipe for Engines with Cylinders 18 × 26 In.—Caledonian Railway of Scotland.

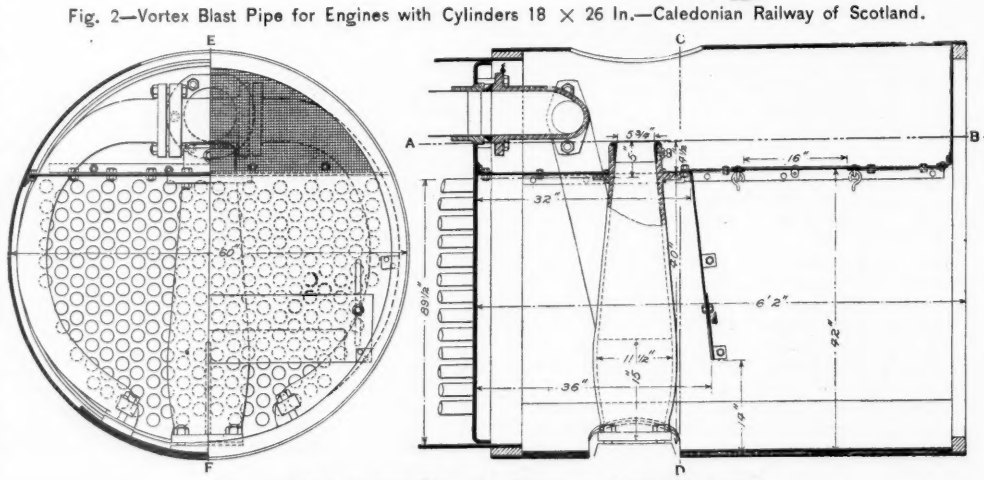


Fig. 3. Single Exhaust Pipe, East Tennessee, Virginia & Georgia.

speed of the engine; the analysis of the coal which gave 7.66 per cent. of volatile matter—an unusual figure for Pocahontas coal; the cylinder condensation, and consumption of the jackets and numerous other minor points. The tone of all the discussion was decidedly skeptical.

Professor Thurston replied to the criticisms, contending that the tests had been made with extreme care and must stand until disproved. That his comparisons with a perfect engine had been made to enable the profession to see just how much room there was for improvement, 25 per cent., if the tests were correct, of which he had little doubt. The weather being very inclement the afternoon was devoted to informal discussions of matters of general interest.

In the evening the Society met at 8:30, and took up the regular programme of papers. Mr. George S. Morison first read his paper on Expansion Bearings for Bridge Superstructures. The paper described the various devices made to provide for changes of length in long bridge spans and more particularly the expansion bearings in the Memphis bridge, which were illustrated in the *Railroad Gazette*, Sept. 8, 1893. The paper describes further some modification of the Memphis bearings put in use on the Burlington bridge over the Mississippi River at Iowa and later in the viaduct at the Mound street yard of the St. Louis, Keokuk & Northwestern Railroad. An abstract of the paper appears in this issue.

The discussion on this paper was on two main points, viz.: The probable flattening of the rocker bearing which he recommends, when the pressure is very great, and the collection of sand and grit on the rocker bedplate, which would necessitate frequent sweeping and cleaning.

By special request, Mr. Barton Cruikshank presented a short paper on a device for drill-jigs.

Mr. Frank A. Scheffler followed with a paper describing A Curve Delineator. This is an old device with a very ingenious attachment for describing arcs of circles. It is a modification of the perspective linead and works upon two pins or pegs after the same manner.

A carefully prepared paper, Notes on Belting, was read by Mr. Fred W. Taylor. This was the second longest paper offered and consists of results, data and rules gathered from nine years of experiments with belting.

Some Experiments on the Effect of Water Hammer was the title of one of several papers presented by Prof. R. C. Carpenter. It was read by his representative. These last four papers brought out a little good humored discussion which was rather more for pleasantry than for criticism. The session closed at a late hour, the programme for the evening having been carried out.

PAPERS AT THE MEETING OF THE MECHANICAL ENGINEERS.

Recent Progress in the Manufacture of Steel Castings, by H. L. Gantt.
Crucible Furnace for Burning Petroleum, by W. E. Crane.
Strength of Rim Joints in Fly Band Wheels, by J. B. Stanwood.
Use of the Indicator for Continuous Records in Dynamometric Testing, by William S. Aldrich.
A Curve Delineator, by Frederick A. Scheffler.
Steam Piping and Efficiency of Steam Plants, by William A. Pike.
A Modern Disinfecting Plant, by W. H. Francis.
A Method of Manufacture of Large Steam Pipes, by Charles H. Manning.
Theory of Direct Acting Steam Pumps and Its Results, by David Guelbaum.
Test of a Boiler Using Grates with Small Percentage of Openings, by Frederick A. Scheffler.
New Form of Prony Brake, by R. C. Carpenter.
On the Maximum Contemporary Economy of the High Pressure Multiple Expansion Steam Engine, by Robert H. Thurston.
The "Buckeye" Valve Gear, by Albert K. Mansfield.
Some Experiments on the Effect of Water Hammer, by R. C. Carpenter.
Experimental Determination of the Effect of Water in Steam on the Economy of the Steam Engine, by R. C. Carpenter and L. S. Marks.
Cumulative Errors of a Graduated Scale, by W. A. Rogers.
Constants for Correcting Indicator Springs That Have Been Calibrated Cold, by R. C. Carpenter, Lionel S. Marks and S. H. Barraclough.
A Device for Drill Jigs, by Barton Cruikshank.
Notes on Belting, by Fred. W. Taylor.

Ships and Shipping.

The last vessel for the Brazalian Navy is ready to sail, the Nictheroy, the America, Santuit and Moxoto having already departed. The Pirating, formerly known as the Destroyer, postponed her departure on account of the storm. Considerable interest will be aroused when this fleet of improvised warships goes into active service in the Brazilian Navy, as we may get some lessons in the use of ordinary commercial vessels for warfare.

The contract for two of the new gunboats, Nos. 8 and 9, has been awarded to the Newport News Dry Dock & Shipbuilding Company, in compliance with the recommendation of the Construction Board. These gunboats are radical departures from existing types. They are designed for navigating shallow streams, and especially on the Chinese station, and must develop 14 knots an hour. The bid of the Newport News Company was one-third less than any other.

A dispatch from the board engaged in conducting the official trial of the new cruiser Olmypia gives the speed made by the vessel over the course in Santa Barbara Channel as follows: The maximum speed, 22.3 knots, average 22.15. This is subject to a reduction of three tenths of a knot for the force of current, leaving the average speed so far developed 21.85 knots. According to the dispatch the run was interrupted by disarrangement of a valve in the feed-water service, but all other machinery worked perfectly. The other trials were interrupted by fog, but will be resumed after the vessel has been coaled and her machinery examined.

The North German Lloyd Steamship Company has established a new line between Baltimore and Bremen, which will be known as the Roland Line, and will comprise three steamships, the Strassburg, Braunschweig and America.

Railroad Matters in Chicago.

Passenger Traffic.—Railroad officers, while failing to report any material change in the volume of passenger business, differ in their views. General Passenger Agent Eustis, of the Burlington system, stated that, while the local and through business on his line was light, it was not, on the whole, a disappointment, as he had anticipated a heavy decrease. "We have," he said, "materially curtailed running expenses by taking off trains, hence our loss on business is in part compensated by reduced expenses. I do not look for an early improvement in travel, as the business was overdone during the Fair. I mean that every one who could possibly take advantage of the cheap rates to do up his traveling for this year did so, and the public is now taking a breathing spell." An officer of the St. Paul said that business was rather light, but they were doing better than anticipated. He thought the volume of travel had reached a minimum, and said they had cut down their train service. At the office of the Chicago, Rock Island & Pacific it was said that while the earnings of the road were small when compared with the closing week in October, the shrinkage from those of the fourth week in November last year was much less than they had estimated. The management also hopes to make a fair comparison in December with the same period last year, but does not look for very large results." The officers of the Louisville New Albany & Chicago were well pleased because of an increase in November earnings over the same time last year, and said, all things considered, their passenger business was very fair. The Michigan Central is also reported to have increased last week. The other lines, and particularly the Santa Fe, reported a decreaee in November receipts, but said the decline from last year was less than looked for.

It was generally said that the bulk of earnings came from interior local traffic, and that the diminution was almost entirely on through business, some reporting a gain on their interior locals.

Freight Traffic.—Thanksgiving week is not expected to be a period of activity in the freight departments of the railroads, and the one just past was not an exception to the rule. On the whole, however, the leading Western lines did even better than was anticipated, as very few roads suffered a severe shrinkage in earnings compared with the week ending Dec. 3, 1892, and a few secured an increase. The Rock Island was "disappointed regarding grain and livestock traffic, but some other departments have done very well. Advices from the chief grain sections indicate an enlarged movement of corn and oats to market within a fortnight." The St. Paul said "freight business is light, but not so poor as was recently feared; the net decrease from the daily average a year ago is not large, and the final figures for last month may show that we were more scared than hurt. The prospect for future business is also fair; our advices from the chief wheat-growing sections state that 33 per cent. of last year's crop is a conservative estimate of the marketable surplus still held in farmers' hands. A large percentage is held back for higher prices, and although it may not come out for some time, the business is assured. There is also a large amount of corn and other grain along the Iowa division that will give us a good business later on."

The week's receipts of grain by the different roads given below show a decrease of 359,000 bushels from the week ending Dec. 3, 1892. There was also a shrinkage of 11,050 tons in flour and miscellaneous freight, but the comparisons are unfair, as the past week represented only five days' business, against six days in 1892. The outward shipments of merchandise and heavy freight were equal to expectations. The most marked feature, however, was the large increase in lumber, which aggregated 70,876,000 ft., against 11,871,000 the week immediately preceding, and 23,442,000 the week ending Dec. 3 last year.

Iowa Rates.—The application of the strictly Iowa railroads, *i. e.*, those originating and terminating in the state, to the State Board of Railroad Commissioners for permission to materially advance rates on all local business is likely to result in a lively contest between the roads and jobbers in Iowa towns. The latter on account of their inferior position compared with those in large cities outside the state are unable to compete for business unless they obtain advantages in the way of very low freights. These favors have for years been granted by the Railroad Commissioners, who fixed a low schedule of rates which would long since have either driven the roads into bankruptcy or caused their entire abandonment because of an inability to earn operating expenses, had not the through trunk lines from Chicago and other large cities allowed the Iowa lines a much larger percentage on all business originating on the latter. The heavy percentages thus received enabled them to live. Managers, while expressing sympathy with the Iowa roads, said the division of rates put in force Nov. 1 would be strictly adhered to, and that the talk of Iowa jobbers about a trunk line conspiracy to injure them was sheer nonsense. It is not to the interest of the Chicago reads whose system traverses the Western, North and Southwestern states to injure any interest in their territory. On the contrary, their officials fully appreciate the fact that their prosperity is closely allied with that of the country they traverse. Hence they will labor to build it up instead of conspiring for its destruction, as is charged by demagogues.

The following shows the deliveries of flour and grain at Chicago for the week ending Dec. 2, and the same time in 1892, and the amount brought by each road:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
	Bbls.	Bush.	Bbls.	Bush.
C. & N. W.	13,350	738,000	41,824	885,000
Ill. Cent.	3,150	501,000	450	500,000
C., R. I. & P.	9,000	257,000	4,200	842,000
C., B. & Q.	9,591	586,000	17,136	1,080,000
C. & Alton	.....	166,000	1,950	113,000
C. & E. Ill.	150	69,000	150	97,000
C., M. & St. P.	15,450	611,000	33,125	381,000
Wabash	600	158,000	1,650	72,000
C. & G. W.	20,758	191,000	32,117	195,000
A., T. & S. Fe	600	154,000	300	132,000
L., N. A. & C.	.....	9,000	.....	2,000
Totals	72,649	3,440,000	132,902	3,799,000

The following shows the deliveries of grain and flour at Chicago for the month of November and for the corresponding time in 1892:

	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
	Bbls.	Bush.	Bbls.	Bush.
C. & N. W.	69,910	3,695,000	125,635	3,265,000
Ill. Cent.	21,950	2,554,000	2,250	2,209,000
C., R. I. & P.	55,240	1,610,000	23,103	1,622,000
C., B. & Q.	55,211	4,257,000	92,914	6,370,000
C. & Alton	29,200	1,286,000	11,575	825,000
C. & E. Ill.	1,500	400,000	150	385,000
C., M. & St. P.	74,000	2,726,000	91,090	2,064,000
Wabash	4,650	759,000	8,920	426,000
C. & Gr't W.	73,929	797,000	124,131	1,144,000
A., T. & S. Fe	1,990	1,190,000	900	661,000
L., N. A. & C.	.....	31,500	336	35,000
Totals	387,580	19,305,000	481,001	19,008,000

The following shows the number of carloads of live stock delivered at Chicago by the undermentioned railroads during the month of November for four years:

	1893.	1892.	1891.	1890.
	Cars.	Cars.	Cars.	Cars.
A., T. & S. Fe	1,423	1,880	1,831	1,959
C., B. & Q.	6,057	5,414	7,160	6,117
C., R. I. & P.	2,041	2,591	2,424	2,409
C., M. & St. P.	3,506	3,888	3,934	3,564
C. & N. W.	4,038	4,657	5,285	4,332
C. & A.	1,749	2,075	1,976	1,980
C. & E. Ill.	448	557	627	427
C. & G. W.	849	808	1,147	1,178
Ill. Cent.	1,588	1,915	2,601	2,088
Wabash	1,264	1,676	1,782	2,188
Wis. Cent.	250	413	474	408
All other roads.	623	527	699	668
Total cars	23,833	26,381	29,940	27,338

The number of carloads of livestock received during the first 11 months of this year was 250,919, as against 284,124 last year. Shipments were 73,005 cars, as against 91,811 cars.

The heavy falling off in the livestock traffic the present month was a disappointment to the managers of the leading roads, who anticipated a much larger business, especially in cattle, of which large supplies were said to be held on the Western ranges for the late autumn market. The fact that the cattle have not come forward is now regarded as strong evidence that the supply has been overestimated. The following were the receipts of cattle, hogs and sheep for November, compared with same month in 1892:

	Cattle.	Calves.	Hogs.	Sheep.
1893	270,369	15,297	557,397	258,966
1892	326,950	14,744	646,313	178,968
Increase	.....	553	.....	79,998
Decrease	56,581	.....	88,916	.....

The following shows the number received for the expired 11 months of 1893, compared with the same time in 1892:

	Cattle.	Hogs.	Sheep.
1893	2,908,049	5,431,244	2,804,747
1892	3,282,476	7,049,796	1,987,142
Increase	.....	.....	817,605
Decrease	374,427	1,618,552	.....

The shipment of livestock by the eastbound roads for the month of November, and the corresponding time for three preceding years, compare as follows:

	1893.	1892.	1891.	1890.
	Cars.	Cars.	Cars.	Cars.
B. & Ohio	110	483	288	381
C. & Erie	273	180	336	65
C. & G. Trunk	1,223	1,488	1,100	1,200
Lake Shore	1,976	1,545	1,531	1,582
Mich. Cent.	564	1,654	729	850
N. Y., C. & St. L.	87	277	1,462	1,208
P., C., C. & St. L.	135	193	121	195
P., Ft. W. & C.	731	964	1,045	1,070
Totals	5,099	6,836	6,612	6,548

The number of head of livestock for the expired 11 months of the year and the same time in 1892:

	Cattle.	Hogs.	Sheep.
11 months, 1893	832,394	1,946,972	420,854
11 months, 1892	1,028,257	2,707,811	455,249
Decrease	195,863	760,839	34,393

CHICAGO, Dec. 4.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

"H. D. W" writes, in another column, to show one of the defects of the "mixed-per-diem" car service theory as generally advanced. We have always maintained that the best definition of "average" was the ingenious schoolboy's—"a thing that a hen lays eggs on"—and now we are sure of it. As H. D. W. shows, averages will never enable us to fix car service rates on a scientific basis. His argument is based on the perfectly evident fact that cars deteriorate by weather, when standing idle, as well as by wear when running: and it is fair to mention the equally well known fact that cars often deteriorate in *inverse* ratio to their mileage, for the reason that while they are ostensibly standing still and earning no mileage they are being pulled out and pushed back in the process of taking out other cars from the same team track, and this switching causes more damage than would result from the ordinary travel that a car would be subject to in the same number of days. The straight per diem rule would work some injustice, for an intermediate road hauling borrowed cars loaded, long distances, would get them very cheaply as compared with a terminal road hauling them short distances; the latter could not make the shipper and consignee pay for all of the delay, and would have to save itself by demanding a larger proportion of the joint revenue on the freight carried in the car. But as the per diem system has the one great advantage of hurrying cars home, where they are under normal conditions, the position of those who prefer it as a far lesser evil than that we now labor under, is undoubtedly sound. Getting his cars home is now the most unsatisfactory work that a car service man does. Under a per diem system the process would be practically automatic, for the borrowers would get them home. The mixed system would be the ideal, if one could discover the just basis for fixing the rates; but who can do this?

Heavy or Light Engines for Passenger Trains.

Mr. Lauder made some remarks at the November meeting of the New England Railroad Club to the effect that, if it is necessary, in order to get steaming power, to have such enormous weight as is the case with some recent locomotives, a different type of engine must be used than the eight-wheel type on the Old Colony, "and this means going into the complication of 10-wheel engines or moguls." He thought that it was better to divide the trains in two parts when the engine, to haul the train, must exceed 55 tons total weight. He also argued that it is true economy to gain safety, which is more important, by dividing the train in two parts rather than to use a heavier engine. He believes that instead of increasing the weight of passenger engines, better results can be got with a lighter engine carrying a higher pressure of steam. His words are: "A 50-ton engine with 18 × 24 cylinders, carrying 200 lbs. of steam, will handle a train which a 60 or 70 ton engine with a lower pressure would have difficulty in taking care of. It is a mistaken idea that it takes an immensely heavy engine to furnish the proper amount of adhesion to handle a passenger train. Any one who has made experiments with the dynamometer will understand this."

There would be no discussion of the point that Mr. Lauder has brought out if the great volume of experience in this country and the conditions of the passenger service were well understood. No argument would be possible, for the conclusion is the same for all lines of inquiry. Passenger service here varies in character from a heavy, slow service, not unlike that of ordinary freight trains, to a light, fast service, in which speed rather than train weight is the ruling requirement. Hauling 16 passenger cars, half sleepers, making an average of 30 miles an hour and making stops at all the principal towns or being frequently held by block signals, is freight service so far as the engine requirements are concerned. This service takes a heavy engine for the necessary adhesion weight. The Empire State express, with 5 cars, run at an average rate of 50 miles an hour, making few stops, and having clear right-of-way is a passenger service pure and simple; and that is what is generally meant when an argument like Mr. Lauder's is made. It is the kind of service which the advocates of a single driver, large-wheel locomotive assume to be representative passenger service when they criticise the 10-wheel type of passenger engine. There is no marked difference between passenger and freight service arising from a difference in the kind of lading, and therefore, in discussing locomotives one must stick closely to the exact nature of the work to be done, no matter whether the load is made up of passenger cars or freight cars.

To criticise generally the use of 10-wheel or mogul locomotives on passenger trains is to reason from limited requirements to general conclusions. On many roads 10-wheelers or moguls are as necessary in some classes of passenger service as they are in freight service. Sometimes economy alone necessitates the pooling of locomotives in passenger and freight service, and as the locomotives must be equal to the most severe work demanded of them, the conditions compel them to be well adapted to freight service. There is no principle involved which makes it necessary or desirable for a railroad company to maintain two types of engines, one for passenger and one for freight trains, where a single type will do.

The 10-wheeler or the mogul is just as safe as the 8-wheeler, and is no more detrimental to the track. The 10-wheeler is not a "complicated" machine when compared to an 8-wheeler. The main differences between the two is the addition of two parallel rods one pair of driving wheels and boxes, a pair of equalizers and a pair of springs; all of which are simple and add trifling complication to the machine.

However much a railroad company may wish to run eight-wheelers, the time comes when the increase of traffic and the introduction of block signals, which hold trains when running behind time, so increase the demand upon the engines that 10-wheelers or moguls must be used to get the adhesion necessary for acceleration after slowing or stopping; otherwise double-headers must be used or the train be divided into two sections. This has been the experience of one of the most important roads of this country, and a road on which the eight-wheel type has been developed in weight and power to a point of questionable safety for the permanent way. But it is an error to say that it is safer to run a train in two sections than to use 10-wheelers or moguls. The rear collisions of any year, and especially the last two months of the Fair, furnish evidence enough on this point.

We will leave here the matter of safety, which Mr. Lauder has said is of the most importance, saying in passing that there is probably not an operating officer who has had experience with double-headers or with double train crews for trains run in two sections who would not unhesitatingly say that it is cheaper to use a mogul or 10-wheel engine and run single trains where possible.

Arriving now at the principal part of Mr. Lauder's argument, namely, that relating to the power required to haul trains, we start out with the understanding that we will consider two distinct classes of service: fast light service and fast heavy service. For the high-speed light service where the trains have the right-of-way, much adhesion is needed only at starting; and if there are no block signals or the train is not held by signals, but is allowed to proceed with a clear track from terminal to terminal, or between stations far apart, and there are no unusual conditions such as heavy grades, unusually slippery track or frequent snowfalls, a very little weight on drivers will furnish all the adhesion that is necessary. For very little power is required to keep a train in motion when it is once accelerated to a high speed, and as Mr. Lauder has said, this has been shown by the dynamometer car. But this service needs great boiler power, frequently amounting to 1,000 or 1,200 H. P. Without using some of the unusual forms of water-tube boilers and with the present type of locomotive boiler this great steaming power can only be obtained by increasing the weight of the engine, and it is a matter of indifference whether this weight is carried on drivers, thus increasing the adhesion, or on trucks.

So long as the service is such as has just been described in which great adhesion is not necessary, Mr. Lauder's suggestion of an increase of boiler pressure to gain increased economy and increase the cylinder power at high speed, may be of value. Lack of cylinder power is what limits the power of high speed engines generally; commonly there is enough steam. There is no increased economy from exceedingly high pressures in simple engines unless the steam be wire-drawn through the throttle, for the reason that the losses resulting from the bad action of the valve motion at short cut-offs more than offsets any gain to be derived from the higher steam pressure. With the compound, higher steam pressures can be utilized without wire-drawing, and in fact to run with a partialy open throttle is wasteful with compounds. With simple engines the wire drawing, say from 200 lbs. to 150, superheats the steam considerably and a longer cut-off can be used because of the lower pressure of the wire-drawn steam. With the longer cut-off better port openings are obtained and there is less loss from compression and back pressure.

Higher pressures, even to the extent of excessive pressure, say 500 lbs. to the square inch, or higher, will not enable an eight-wheel locomotive weighing "55 tons" to haul on schedule time a heavy passenger train with frequent stops, or if often slowed down by signals or in bad weather. For such conditions great hauling power is necessary, and to get this there must be great weight on drivers. Generally no more steam is required for the heavy slow service than for the fast light service, but there is a decided difference between the two essential characteristics of the engine; one must have a great hauling power, the other great steaming power. The best way to get the lightest engine that can be used for a given service is to increase the efficiency of the engine and the boiler, and there are many ways of doing this. The time is fast approaching, as has been recently shown by Mr. Axel Vogt, of the Pennsylvania Railroad, when the boilers and cylinders must be made more efficient, or the increase in the weight and speed of railroad trains must cease. An increase of pressure will not give the necessary better efficiency; something more must be done. That there is room for an improvement will appear from the following facts: The coal used on locomotives will evaporate twice as much water in a stationary boiler of the locomotive type as in the same boiler under locomotive conditions, due almost entirely to the difference in the forcing of the fire. No manufacturer would expect to get 1,000 H. P. with less than four times as much boiler capacity as is common in locomotive practice. The locomotive cylinders probably give a horse power for about 30 lbs. of steam per hour under good conditions; some compounds are more efficient. A stationary engine of equal power, say about 1,000 H. P., will give a horse power for about 15 lbs. of water per hour. Of course, it is not possible to make locomotives as efficient as a condensing steam engine plant, but much can be done to improve them. There is a possibility of saving at least 30 per cent. in the boilers and 20 per cent. in the engine cylinders; this would give double the useful work from the same boiler, or, what is the same thing, decrease the necessary boiler capacity about one-half, which would greatly decrease the incidental weight of locomotives.

The Advertising Value of Decoration.

During the Western Railway Club's discussion of Mr. Gibbs' paper on cars at the World's Fair one member said in effect that the competition for passenger traffic compels the various lines to follow each other in elegance of equipment and expensive appurtenances, and that therefore railroad companies are obliged to haul almost anything in the way of a car which the sleeping car companies offer as a further attraction, even if the greater weight is a serious drain on the capacity of the motive power. Indeed they must not kick if the dead weight per passenger is as great as in some of the cars exhibited at the World's Fair, which weigh over 105,000 lbs. for less than 15 passengers. If this is true the time is coming when, as a matter of protection, the traffic associations will have to consider, in addition to the inducement offered the public by differential rates, the inducements of differential equipment. It may come to pass that the associations will rule that only the long and less desirable

lines of travel may offer hand painted and embroidered, satin finished sleepers while the lines of shorter routes and quicker times may use only the plainest wood finish.

Perhaps it is worth while to look more carefully into what the public really wants, and not assume that the best way to increase traffic is to develop the spectacular effect. Color and embroidery may catch a passenger once, but on his second trip he will base his judgment on actual experience, with which the spectacular effect of the interior decoration has little to do. The first and most important matter with passengers probably always will be cost. With conditions otherwise alike, the cheapest route will get the greatest traffic. Rates being settled by agreement between competing lines, the most effective means of getting traffic is taken out of the hands of operating officers, but enough variety of attractions remains, aside from interior decorations to enable any road to worry its competitor. Next after cost comes comfort, and in this the most important item in summer or winter is ventilation, yet who has ever heard of a passenger agent advertising well-ventilated cars? and is there a road in this country where the discipline of the operating department is equal to the task of making porters and brakemen use ordinary common sense in handling the ventilating appliances? So flagrant is the neglect of this matter by operating departments, and so useless are the best ventilating appliances in the hands of the employees of these departments, that the Committee appointed by the Master Car Builders' Association to report on better means of ventilation of passenger cars have pretty nearly reached the conclusion that so long as the employees of the operating department are permitted to neglect this matter as they now are, it is impossible to put on any mechanical appliance that is better than the simple deck sash, now commonly applied to cars but seldom used in a sensible way. This, then, is a matter that can be considered by a passenger agent before taking up a spectacular finishof cars. Good light and uniform heat come next; and to get these is cheaper than to haul a useless dead weight in fancy cars. One who sits for hours in a badly lighted or an overheated or underheated car gets little consolation from an embroidered satin head-lining or from the brilliant markings of an expensive southern wood costing $800 per 1,000 ft. or from nickel-plated bath tubs, or the other frills that make up a spectacular car. Perhaps next in order comes the matter of safety. Queerly enough people will ride over the road which gives the greatest comfort even if there are less safety appliances and even if the more comfortable road has some reputation for wrecks and derailments. If a road has good lunch stations and clean, well-ventilated cars that are properly heated, it will probably in the long run come out ahead of the road that has more frills and less comfort. At least we believe so, having an abiding faith in the common sense of the average man.

There is now much complaint about the great and unnecessary weight of sleeping and parlor cars, but who is more responsible for the existence of such than the rail roads themselves? If the passenger agents did not ask for the purely ornamental features they would not get them. One thing is certain; that is, the present rate of increase of weight cannot keep up unless the running time is increased or the locomotives made heavier. Perhaps it would be quite as well to heed the complaints of the motive power departments and lessen the loads and try the effect of plainer and lighter cars, constructed and finished with sound science and cultivated taste. Perhaps we have passed the stage of barbaric decoration and have entered that of high utility. The philosophers assure us that this is the order of the steps in evolution.

The Air-Brake Decision—No Stay of Injunction.

The last decision in the air-brake patent litigation must be serious for the New York Air-Brake Company. Two motions were argued before Judge Townsend in New York on Nov. 24, in which the New York company asked permission to sell about 3,000 sets of air-brakes which they have, completed or near completion, on their hands, upon the conditions that they should pay into the court a proper royalty and that they should take an immediate appeal from the decision which enjoined them. Judge Townsend filed his opinion and decision respecting these motions on Friday last. We print the same in full elsewhere in this issue.

In brief, it is set forth in this opinion that, if the New York company be permitted to market these 3,000 brakes, it could realize therefrom about $120,000; if, however, such sale be enjoined, the apparatus would be worth less than $20,000 to them, or, in other words, about its scrap value. On the other hand, it was alleged, and it was not disputed, that the New York Air-Brake Company is an irresponsible organization, "possessing no property other than its patents and such unsold apparatus as it now has on hand," and it further does not appear that the company is under contract to supply air-brakes to any one.

In disposing of the motions, the judge decides that to permit the sale of the infringing air-brakes at a fixed rate per set would be to "pervert the decision of the Court from an injunction into a license," and would "establish an infringing rival in a competing business," and he emphatically denies the motions. The judge divests this decision of harshness by referring to a circular letter issued by the New York company which seems to have been injudiciously sent out before these motions came to a hearing. He quotes from this circular letter as follows: "So far as the freight triple valve is concerned, the decision is unimportant, for no principle is involved, and only trifling and unimportant changes are necessary to make our triple valve free, in view of the very narrow construction given to the Westinghouse patents by the Court." He naturally concludes that, if it is such a simple matter to continue business and escape infringement, it will not be a serious hardship for the New York company to store the infringing air-brakes which it now has on hand, until a final decision is reached in the United States Court of Appeals.

In the suit which was based upon the Westinghouse divisional patent No. 448,827, it will be remembered that the New York company admitted the infringement, but denied the validity of the claims in that patent, setting forth that the claims were designedly made too broad, and, through their counsel, arguing at length that such claims "must be construed to cover all quick action triple valves whether known or unknown at the date of the patent, except only those already covered by No. 360,070 and No. 336,837," and that consequently, if these claims were sustained by the court, it would be impossible to construct a quick-action triple valve which would not infringe the Westinghouse patents. The court has now established the validity of these broad claims, and, from the New York company's own showing, it is a little difficult to understand how the "trifling and unimportant changes," referred to in their circular, are going to permit them to continue in the quick-action air-brake business.

It has not been learned whether the New York company still intends to appeal its case, since its proposition to do so has failed in obtaining permission to sell the air-brakes on hand, but we have no doubt that it will do so.

Railroad Commissioner Billings, of Michigan, has made a special report to the Governor on the collisions at Bellevue, Sept. 27; at Jackson, Oct. 13, and at Nichols, Oct. 20. He also reports on the disaster at Hamburg, on Oct. 25. Railroad accidents are generally not reported on by the Commission except at the end of the year, the present cases being treated exceptionally owing to the large number of casualties, 47 persons having been killed and 54 injured in these accidents. The circumstances of the accidents are, however, treated very briefly and the findings are correspondingly inconclusive, and we shall therefore refer only to a few points of interest which are brought out. It is stated that in the case of the rear collision at Bellevue, which occurred about 1 a. m., there was a streak or bank of fog just east of the station which completely obscured the tail lights of the leading train, while there was no appearance of fog at any other point on the road. This is a striking illustration of the complications which train running is subject to by the existence of fog, and the Commissioner very naturally concludes that the block system is the only true remedy for a collision of this kind. But, in saying that the disaster could not be averted by anything short of that, he invites criticism from men who have run trains under the time interval for years without disaster; for, in this case, the second train was 10 minutes behind the other when only 13 miles back of Bellevue. When one train, following closely behind another, gains 10 minutes upon it in that distance, it is plain that there was some gross carelessness somewhere. In the Jackson case, Commissioner Billings evidently believes that the man who was supposed to have turned the cock in the air-pipe *was* seen on the train at Jackson. We have understood that every one else interested, including the officers of the road, believed that the evidence to this effect was *not* reliable. The report states that engineer Whalen used the air-brake to reduce his speed from 50 miles an hour to 20 miles an hour while running a distance of 2,500 ft., in or near Jackson yard. The cause of the accident is held to have been either the action of the supposed tramp *or* inadequate air pressure in the auxiliary reservoirs In the Nichols case Mr. Billings lays no emphasis except on the fire, and he states that a circular has been issued to the roads "looking to improvements in strength and safety" of Baker heaters, and to the provision of fire extinguishers for passenger trains. Nothing is said about the conduct or character of the engineer and conductor, and nothing about the lamps or the strength of the cars. In the Hamburg case a freight train fell into a "sink-hole" and three men were burned up in the fire which ensued, there being two oil-tank cars near the engine. Placing these cars in that position was against the rules, though no evidence is presented to show that they would not have produced just as bad a disaster if they had been in their proper places. The embankment which sank was from 2 ft. to 9 ft. high, across a tamarack swamp about 1,000 ft. wide. Soundings had been made which appeared to indicate that the bottom was firm.

The counsel for Messrs. O'Brien & Clark, in the prosecution of their claims for extra work against the city of New York, are reported as having "determined to fight as long as there is a legal foot of ground to stand upon, and if all other means fail to push the claims through the legislature." One would hardly expect that a legal foot or inch even of ground remained on which to base any further action in the courts. These contractors, backed with great political and machine influence, aided by the most brilliant legal talent, have been defeated in three courts, the last in the highest court of the state, the Court of Appeals. The claim has also been before one legislature, and a bill passed the Senate and Assembly, notwithstanding the presentation of a strong protest declaring the claims illegal and almost fraudulent by the Mayor, Commissioner of Public Works and four members of the Aqueduct Commission. The bill was killed by a Governor who was friendly to the claimants, to the surprise of everybody; but with a stipulation that if O'Brien & Clark brought suit in the Circuit and Appellate Courts, it should have preference. It has been to the Appellate Court and was decided against the contractors. How they can now hope under the present political aspect and in the face of three decisions of the courts to get a bill through the legislature is inconceivable. The law, which determines the rights of a railroad contractor under a certain stipulation of his contract should determine the rights of every other contractor, and any act of legislature that makes special laws to favor any particular contractor should be declared unconstitutional. The difference between a railroad contractor and a municipal contractor is not apparent in the consideration of their contract rights or the laws which govern them, and the rights of these men must be determined by the contract under which the work was undertaken, the same as a contractor on any other work. The legislature cannot establish any different relation, and if money is appropriated to be paid to these men it amounts to a gift and should be enjoined by the courts as unconstitutional, and a misuse of public funds. The fact that the legislature is the governing body of the city should not make any difference.

The British Board of Trade report on continuous brakes for the half year ending June 30 last has just been issued, and shows that of the 11,758 engines and 61,429 cars used in passenger service on the railroads of the United Kingdom 98 per cent. are equipped with brakes which the companies say comply with the conditions prescribed by the Board of Trade. Another one per cent. partly complies, so that the total amount of passenger train stock not fitted with any continuous apparatus is only 121 engines and 734 cars. The percentage of cars equipped with approved brakes has risen quite rapidly, having been on June 30, 1886, 52; 1888, 62; 1891, 86; 1892, 94. The number of cars fitted with the Westinghouse automatic is now equal to about one-half of the number fitted with the automatic vacuum brake. The tables of brake failures show only one in which there was an accident to a train or a collision was imminent; but there are a number of cases in which trains ran past the prescribed stopping place in consequence of dirt getting into the valves of vacuum brakes, ice in hosepipe, etc. On the Metropolitan, in one instance, an engineman had the steam shut off from his ejector, and in another case air leaked into the vacuum chamber. There are two cases in which an engine was coupled to a train and the cock in the Westinghouse trainpipe was not opened. In one case a shunter shut the cock by mistake, and in another the coupling was not made between the second and third cars. The one accident to which a brake failure is held to have contributed was the derailment of a runaway train on the Tralee & Dingle 3-ft. gage road at Camp, Ireland, May 22. The engineman and fireman were killed, but the inspector thinks that the vacuum brake connections were in a leaky condition. The main cause of the runaway was, however, the inexperience of the engineman.

When all is said about the good work done at the World's Fair and the greatness of its success there is left room for a few words about the glaring defects and neglected opportunities. The latest complaint is that the Autocrat of the Medal Department has decided, as the result of some occult reasoning, that enough medals have been awarded and he concludes that "the Chicago daily papers did not treat him fairly anyhow." What if the committees of experts selected to decide upon the relative merits of exhibits did think that more medals were earned than the Autocrat had decided to grant?

Who has anything to say about it? Another matter of egret is that while the Exposition had sufficient money and the Bureau of Awards has a considerable sum left to return to the United States Government, yet the scientific idea was not sufficiently developed in the rulers, including the Autocrat of Awards, to enable them to see the everlasting good that would come to humanity in general, and manufacturers in particular, from a series of tests of competing apparatus. As it stands the medals that were awarded for engines, boilers, dynamos and a great variety of apparatus, such as fire engines, elevators, hoisting gear, etc., were given on judgment and individual preference. No one knows as a fact whether one boiler or engine or dynamo was superior to the other. Not a few of the awards were made on the size of the exhibit and the amplitude of the display. There were money and time enough and talent unlimited to make the hoped for competitive tests and scientific investigations, but the original plan for which many engineers worked so hard was thrown over.

The eleventh annual report of the Northern Pacific (Employees') Beneficial Association for the year ending June 30 last has just been issued. This association has suffered from a decrease in income and increase in expenses for two years past, and the Board of Managers voted on Nov. 1, 1892, to discontinue the sick and accident allowances. The business of the Association is now limited to the medical and surgical care of its members, with a moderate allowance for burial expenses. The expenses the past year were $5,516 less than they would have been but for this change, and "certain classes of patients now make fewer visits to the doctor." The Association has hospitals at Brainerd, Minn., and Missoula, Mont. These hospitals treated during the year 2,399 cases and 16,407 were treated by the surgeons outside the hospitals. A number of the officers of the railroad have made important contributions of books for the use of the patients at the hospitals. The receipts of the Association for 13 months were $103,934, of which about $92,640 was ordinary revenue from members. The average cost per patient per day was, at the Brainerd Hospital, $1.67; at Missoula, $2.26; outdoor and office patients, 82 cents. The total average cost per indoor patient was $44.17 at Brainerd and $57 at Missoula. A populist member of the Legislature in the State of Washington lately introduced a bill making the assessment of dues for hospital purposes illegal, the animus of the bill being to please some dissatisfied coal miners. The railroad men, however, presented petitions against it and, although passed by the Lower House, it was finally defeated.

Demurrage has finally got a foothold in Massachusetts, the Massachusetts & New Hampshire Car Service Association having been formed, to begin business Jan 1. The manager is Mr. E. A. Gordon, who has been at the head of the Providence and the Hartford Demurrage Bureaus since they were started. The circular now is sued is dated at Boston, and Mr. Gordon's office is presumably to be there (17 Milk street). The roads signing the notice are the Boston & Albany, Boston & Maine, Concord & Montreal, Fitchburg, New York & New England and the New York, New Haven & Hartford, the regulations apparently applying at all stations on the roads named, in the states named, except on the Concord & Montreal north of Wing Road. The free time allowed is to be 96 hou.s. This is the same time that was allowed in the association which was formed at Boston two or three years ago, but which, we believe, did not amount to much. This term is unreasonably long, but perhaps it will be better to start with such a limit, and carry it out than to attempt a shorter one, and then honor it in the breach instead of the observance. For that matter, the tendency to length the free time, and to make exception on important commodities, seems to be slightly increasing; at least, it is as strong as ever. The New Orleans Car Service Association has had to let down the bars twice already, and it has only just got into running order.

The news that Admiral Mello has got to sea with the Aquidaban gives an entirely new interest to the Brazilian fight. The Nictheroy (née the El Cid, as the "society" writers of Kansas City would put it) has no business in the open sea with an iron clad armed with long range guns. Her dynamite gun will throw a missile about the size of the first cutter with considerable accuracy up to, say, two miles. If one of these things drop on the Aquidaban's deck the jig is up, but the trouble is that the Aquidaban is quite competent to sink the Nictheroy at three or four miles. The theory of the attack was that the Aquidaban could not get out of the port. The entrance to the harbor at Rio de Janeiro is narrow, and, besides being fortified, is supposed to be obstructed by torpedoes, and it was intended that the Nictheroy should lie outside, under cover of the point, and drop her 11 ft. projectiles over upon the decks of the rebel fleet, and, incidentally, the torpedo boats might sneak in at night and attack the ships inside. But, with the Aquidaban at sea, the situation is entirely changed, for she has a good chance to dispose of her enemies before they get near enough to do her any harm. In the interest of the art of naval warfare, it is to be hoped that the Aquidaban and the Nictheroy will come to a tussle.

The South Carolina Legislature began its annual session last week. It is said that the temper of the members generally is "ag'in' the railroads," as usual. One of the reasons why this feeling is strong just at present is the contest the companies have made over the tax assessment in that state, most of the roads having protested against disproportionate assessments and appealed to the courts. A bill requiring separate cars for colored passengers has already been introduced, though similar bills have been defeated several times. One of the first debates was as to whether it would be in violation of the Anti-Free-Pass Law for the legislature, as a body, to accept the invitation of the Augusta Expostion Company to attend the Exposition in a train provided free by the company. After much straight-lace talk the legislators succumbed to the tempting pleasure of a free ride.

The Siberian Railroad.

Official reports show considerable progress on the great Russian enterprise, the Siberian Railroad, which dwarfs our transcontinental lines. On the western end 160 miles to Kurgan were so far advanced last June that it was expected that construction trains would be running over it before winter. From Kurgan eastward to the river Irtysch at Omsk, 339 miles, the contracts for earthwork were let, and bridge materials got out or contracted for. From Omsk eastward, 386 miles, to the crossing of the river Obi, 66 miles were let and arrangements made for the transportation of materials by steamboats to the crossings of the navigable rivers. Beyond the Obi for 482 miles eastward, a provisional location has been made, and the engineering force has been engaged on the final location; also a little earthwork has been let, and arrangements made for providing the necessary timber supplies. These 1,367 miles will bring the road within 688 miles of Irkutsk, near the southeast end of the great lake Baikal, 400 miles long and from 40 to 60 miles wide, which has long had steamboats, and on which 14,000,000 of a peculiar kind of sal mon have been cured yearly.

The route of the railroad so far is near the fifty-fifth parallel, which seems a very cold place when we say that it is as far north as northern Labrador and southern Alaska, and quite temperate when we find that it is no farther north than Newcastle and Carlisle in England, and 350 miles farther south than St. Petersburg. It is, however, not so frigid as America, and much less temperate than England in that latitude—colder even than in European Russia so far north; for not far to the south are lofty ranges of mountains which make the south winds cold, and not very far to the north are the vast plains covered deep with moss and to a great extent overflowed by the great rivers flowing north which are dammed with ice in their lower courses long after their upper and middle courses are thawed. But between the mountains on the south and the "tundras," as the cold, moss-covered plains are called, there is much land good for pasture and plowing, and especially much timber; and it is reasonable to suppose that a route can be found through a country 1,400 miles wide and 4,000 miles long, containing more than 4,800,000 square miles, which will support several times the 4,000,000 people which is reported to be the total present population of Siberia. And the chief purpose of the Siberian Railroad is to develop the interior of Siberia, and not, as with our first Pacific railroad, to provide for a transcontinental traffic. The Pacific coast of Russia has very little population, and that chiefly barbaric; and the amount of through traffic over the Siberian Railroad is likely to be insignificant. But the interior traffic will be likely to have contributions which our Pacific railroads did not get, for the line crosses a large number of great navigable river systems which, after all, scarcely give any outlet to the country, because they empty into the Arctic Ocean, where vessels can with difficulty reach their mouths. In the aggregate, probably several thousands of miles of rivers can be navigated by steamboats from places where the Siberian Railroad will cross the Tobal, the Irtysch, the Obi, the Yenisei, the Angara, the Lena, the Amoor, etc.

The chief object of the road being the development of the country on its route, there is no reason for the haste with which our Pacific railroads were built, but it may be extended as the country grows. Immigration into it will probably be wholly from European Russia, where the agricultural population is comparatively dense, and many of the peasants have difficulty in maintaining themselves, though heretofore they have not emigrated much.

The Russian authorities in charge of this enterprise have appropriated about $38,500,000 for the first 1,367 miles of the road, or at the rate of about $28,000 per mile, with which they profess to expect to complete and equip the road. The difficulty of procuring and transporting men and materials is considerable, though the navigable rivers assist greatly. Of course, if great haste is not attempted, and work is not prosecuted at many places at once, the railroad can carry its own materials. The iron will come largely from the Ural Mountains, near the western terminus of the road.

One of the difficulties encountered on the western division is a lack of building stone. In some places it will have to be brought more than 300 miles, and, where the rivers will not serve, the cost of carriage will be frightful. Here, doubtless, we should use timber until the road was built, and then bring stone at our leisure for the permanent structures; and so they will do probably in Siberia. Ballast is also very scarce on the western part of the line. Workmen must be brought from European Russia. The natives, at best not very numerous, will not go far from home to work, and take their whole families with them. The climate is such that work is prosecuted only from the middle of May to the end of September, or, deducting the numerous Russian holidays and the rainy days, probably about 100 days a year.

To carry materials to the middle section of the road two steamboats have been ordered, one drawing 8 ft. of water, and the other 3 ft. 6 in., to ply on the Yenise and its tributary, the Angara, the latter of which drains Lake Baikal. Rails will be shipped from England, through the Arctic, to the mouth of the Yenisei—a somewhat venturesome undertaking—to be carried up the river by these steamboats. The vessels were fitted out as for an Arctic expedition.

The Pacific end of the railroad is at Vladivostok, on the Japan Sea, as far south as latitude 43 deg.; but the direction of the road thence, for nearly 500 miles, is northwestward, following the Chinese border; thence it is westward some 2,200 miles to the east side of Lake Baikal. But on this part of the route it is proposed to make 1,300 miles of the journey by steamboats on the Amoor River, which forms the boundary between Siberia and China. Another considerable steamboat journey will be made on Lake Baikal, which will doubtless be a relief to through passengers.

With this line completed, a journey about 8,000 miles long can be made from Paris to the Pacific at Vladivostok. It will probably require something like three weeks of continuous travel to make it, and the Pacific terminus will be more than 500 miles from Tokio, in Japan, and 1,000 from Shanghai, the nearest places European travelers are likely to want to reach.

The Lehigh Valley Strike.

The strike was declared off on Wednesday morning President Wilbur assenting to the terms of the following letter from Mr. G. Robertson, Jr., of the New York State Board of Mediation and Arbitration, and Mr. J. P. McDonald, Chairman of the State Board of Mediation and Arbitration of New Jersey, who had been in conference with both sides for two or three days:

The State Boards of Arbitration of New York and New Jersey desire to know whether, if the existing strike is declared off, the Lehigh Valley Railroad Company will agree to take back as many of their old employees as they have places for, without any prejudice on account of the fact that they struck or that they are members of any labor organization; that in re-employing men formerly in its service the available time shall be so divided among the men so re-employed that they may feel they are again in the service of the company and self-supporting; that in making promotions hereafter the company will make no distinction between men now in its employ and those so re-employed on account of seniority in service or otherwise; that when in the employ of the road committees from the various classes of employees from the branch of service in which the aggrieved party is employed will be received and their grievances considered and justly treated, and that in employing men in the future the company will give the preference to former employees when the strike is decided off. We further think that to prevent misapprehension the Lehigh Valley Railroad Company should confirm the rules posted by Mr. Voorhees Aug. 7 last as First Vice-President of the Philadelphia & Reading Railroad Company. We believe that these suggestions are reasonable, and that if they are accepted by your company the present strike will be at once terminated.

The course of events on the road since our last issue may be described as a continuance of the conditions of the first two weeks. The divisions of the road in New York State and in New Jersey have been got into fair workable condition, but in Pennsylvania the annoyance of new men by the strikers, the lawlessness of the strikers' friends and of loafers, continued to make the operation of the road very difficult. Collisions and derailments of freight trains were reported every day, and at White Haven, on Saturday morning about 2 o'clock, a rear collision of freight trains started a fire which destroyed several buildings, including a hotel. The number of persons killed in this collision was three. Near Bloomsburg an empty engine ran into a freight train, and, having been reversed and deserted by the engineer, ran back at high speed to Phillipsburg, where it struck the inspection engine of Superintendent Wilbur. The men on the latter jumped off, and both engines ran a mile farther and struck a coal train.

The number of wrecks reported on Friday and Saturday was so large that the strikers visibly took courage, and the reporters had much to say about the hopeful aspect of the situation from the strikers' side. On Sunday there was snow at some places and fog at others, so that the running of freight trains was a good deal hampered, and on Monday it was given out that the block system had been put in use to prevent rear collisions. On Monday night several telegraph operators between Hazleton and Delano joined the strikers.

Annual Report of Interstate Commerce Commission.

The seventh annual report of the Interstate Commerce Commission has been sent to Congress, and a summary has been given out to the press. The report opens with the statement that the operation and administration of the statutes on the subject of Interstate Commerce have brought about many reforms in transportation which, compared with the evils that existed prior to the law, amount to commercial emancipation.

The total mileage on June 30, 1892, was 171,563 miles; the total number of corporations, 1,822, and of independent operating companies, 712. The capitalization of roads reporting was $10,2:6,748,184. For the year ending June 30, 1892, the gross earnings reported were $1,171,407,343; operating expenses, $730,997,996; net earnings, $390,409,-

347, to which add $141,960.782 as income from investments. After payment of $416,404,938 as fixed charges $97,614,745 was paid in dividends and $4,314,390 in other payments, leaving a surplus of $14,036,056. There were 821,415 persons employed in railroad service at the end of that year, of whom 2,554 were killed in accidents and 28,267 were injured; 376 passengers were killed, and 3,227 were injured.

The operation of the long and short haul law is stated to have been satisfactory under the construction put upon it by the commission and accepted generally by the carriers. But the effect of a decision of the Court of Appeals in an Iowa case wherein the word "line" in the statute was given a wholly different meaning from that which the commission had held was the proper construction has been startling. This court decision has been followed and expanded by other courts and the need for prompt remedial legislation is urgent.

The commission states that there is no showing upon which any railroad insolvency can justly be attributed to the operation of the law. The amount of stock paying no dividend has considerably decreased since 1888, and a great reduction is noted in the amount of bonds paying no interest. If the issue of capital were restricted to the amount necessary to construct and equip the properties, there would, under normal conditions of business, be much more satisfactory returns.

The commission makes a strong argument in favor of giving it authority to prescribe minimum as well as maximum rates. It is a fact that in respect to transportation from places north to places south of Ohio, and from places east to places west of the Mississippi, carriers "Prevent the carriage of freights from being treated as one continuous carriage from the place of shipment to the place of destination." The practice of overcharging is a widespread evil extending far beyond any excuse that may be offered in its extenuation, and suitable additional legislation is deemed desirable.

It is alleged that "tramp" vessels on the Lakes operating under fluctuating rates prevent the regular lines from publishing through rates in connection with rail carriers. But certain methods pursued by the regular lines are as obnoxious as those of the tramp vessels. Further statements are made with regard to publication of rates for water and rail transportation and recommendation made for amendment, so as to bring these water carriers under the law. Uniform classification will not come from the voluntary efforts of railroad officials, and they should be "urged on by legislation."

Private cars are next discussed. The number of such cars rapidly increased and they began to be furnished by corporations for profit. After a while demand for compensation for the use of such cars was made upon railroad companies. This was acceded to, and large shippers owning private cars forced their use upon the railroad companies. The result is that private cars have come to be substituted in large measure for the cars of carriers. The railroads look upon the practice as a burden alike upon carriers and commerce. Replies to a circular sent out by the commission unite in condemning the private car practice as a great abuse. The subject is submitted for consideration of Congress.

Other paragraphs in the report refer to the National Convention of Railroad Commissioners and to Government-aided railroad and telegraph lines.

The commission recommends additional legislation on the following subjects:

1. With respect to proceedings to inforce the laws and orders of the commission.
2. To give legislative construction to the word "line" in the statute.
3. To provide for establishing through rates and joint through rates.
4. To give the commission power to prescribe minimum as well as maximum rates to competitive points.
5. To provide for the adoption of a uniform freight classification.
6. To make corporations subject to the act liable to indictment for violations of the law.
7. To provide a penalty for failure on the part of carriers to file their annual reports within a specified time.

The Use of Small Sizes of Anthracite Coal for Generating Steam.*

There is, perhaps, no subject of more importance to us all than the generation of steam. In taking up the question of fuel I enter, therefore, a field to which my professional life has been devoted. I shall therefore invite your attention to certain cheaper fuels, viz., the small sizes of anthracite, which are now coming into very general use for generating steam.

Some three years ago I was a member of a commission to investigate the waste of anthracite coal, and the question of utilizing the small sizes. Within my earliest recollection of the anthracite coal business, all the sizes below stove coal were considered of little or no value. Chestnut coal was used about the collieries for making steam, but much of it was thrown away. It gradually became a domestic fuel, and pea coal took its place for generating steam. This size is gradually coming into use for domestic purposes, and buckwheat, rice and barley coal are taking its place for steam. The cost of these coals decreases very rapidly with the size, and the following table shows the size and approximate cost at mines.

Size.	Made Through.	Made Over.	Approximate Price at Mines.
	Inch.	Inch.	$
Chestnut	1¼	⅞	2.75
Pea	⅞	9/16	1.25
Buckwheat	9/16	⅜	0.75
Rice	⅜	3/16	0.25
Barley	3/16	1/32	0.10

NOTE—The above meshes are all round punched.

The cost of transportation of the small sizes is less than that of the large. From the mines to tide, pea coal is charged 30 cents less, and buckwheat, rice, and barley 50 cents less per ton than the domestic sizes.

One difficulty in the introduction of these smaller sizes was the fact that little attention was paid to their preparation, and furnaces were not specially erected for the purpose, but old plants were used with slight changes in the construction of their grate bars. While the sizes of domestic coals are practically the same, there has been a great difference in the small coals and in the amount of impurities they contained. The use of culm is diminishing. What was formerly known as culm contained the buckwheat, rice, barley and pea coal. Now the pea, buckwheat, rice, and in some cases the barley are taken out; and the dust that remains is now called culm. It is still used to mix with bituminous coal, or in a special furnace in which it is burned as dust or to make compressed fuel. It is of no value alone and in its natural state for generating steam.

In burning anthracite sizing is of great importance. The coal burns only on the surface, and, if the size is not uniform, the smaller particles clog the passages between the larger, and prevent a sufficient quantity of air from passing through the furnace. Some have given up the use of buckwheat, rice and barley because of the want of uniformity in the results obtained. The difficulty may be due to one of two causes, or both. First, to bad sizing, and second, to the presence of a large quantity of impurities. President Coxe specially dwelt on the fact that the percentage of carbon, when small anthracites are burned under proper conditions, and not the size, is what determines the amount of water evaporated per pound of coal; but the amount of water evaporated per square foot of heating surface decreases with the size of coal.

Cheap steam is the corner stone of our most important industries, and nothing is more important in obtaining it than cheap fuel. The enormous quantity of these small anthracites made in preparing the larger sizes promises to furnish to the Eastern States a clean and economical fuel which lends itself to mechanical handling far better than any other combustible. The only thing that prevents every ton from being used is the want of knowledge of its peculiarities and of proper methods of determining its value.

In many parts of Europe the price of coal is based upon the percentage of ash, the price being reduced a certain number of cents for each additional unit of ash, and in some cases the deduction is in a geometrical and not an arithmetrical progression. It is of the greatest importance to the producer and user of the smaller anthracites that they should be sold on this basis, with a guarantee on the part of the producer as to the size.

It is not simply a question of the absolute size of these smaller coals, but also one of the relative size of the different pieces which make up the aggregate; that is to say, each size would be as nearly uniform as possible. The smaller pieces tend to stop up the interstices between the larger lumps and checks the draft. The producer should guarantee that a certain percentage of the coal sold as rice should be of such size that it would pass through a mesh of a specified diameter, and over a mesh of another specified diameter. A contract should be made which will require the coal to contain less than a certain percentage of water and not less than a certain percentage of carbon, and that a certain percentage of the average daily sample of the coal would pass through a mesh of a certain size and over a mesh of another size, and that the coal should not contain more than a certain percentage of dust.

A rapid, simple and effective manner of determining the commercial value of small-sized coal President Coxe described as follows, but more in detail.

He says: The foundation of analysis is the obtaining of fair average samples. At each of the collieries samples of each size are taken several times a day, which are put into four separate bins, one for each size. At the end of the week the coal in each bin is thoroughly mixed and is sampled by quartering down until we obtain about 30 lbs., which is sent to the laboratory. Each of the samples obtained may be used for any of the five following operations: 1, Determination of size; 2, of the slate; 3, of the ash; 4, of the water, and 5, of the specific gravity of the coal.

Determination of Size.—This is done by an apparatus which consists of a cubical box, the top and one side of which are open, and into which slides a series of drawers, five or six in number. These drawers are wooden frames 1¼ in. deep, about 12 in. wide and 14 in. long. The bottom is a sheet of perforated metal. The box is so adjusted that it can be revolved easily and in such a way that the axis of the box describes a cone. This shakes the coal and causes it to move from one side of the screen to the other, soon sizes the coal. The sizes of the perforations which are employed in the screens are ⅞, 9/16, ⅜, 3/16, 3/32 or 1/16 in. round. It is not necessary to weigh the part to be tested, but it is necessary that the entire sample obtained by quartering down should be screened, otherwise you would not have an average sample. The average percentage of each size is then determined.

Determination of Slate.—While in large coal the percentage of slate can be determined by picking it over by hand, it becomes very difficult to do so with the smaller sizes of coal. A method depending upon the difference in the specific gravity of the coal and slate is therefore adopted. The specific gravity increases with the amount of ash, and also with the amount of bone or slate attached to it. A solution of chloride of zinc is made of the same specific gravity as the coal, about 1.72, which varies, of course, with the nature of the coal and the nature of the impurities. The coal to be examined is poured slowly into the solution and stirred from time to time. The slate goes to the bottom, and the coal floats and is skimmed off and put in a dish. The coal and slate are then washed, and dried and weighed, and the percentage of each calculated. Experiments have shown that this method of determining the percentage of slate gives results as accurately as those obtained by the most careful selection by eye. It takes but a few minutes to make a determination, outside of the time necessary to dry the coal.

Mr. Coxe then described a simple apparatus for drying the coal; a hot-air box having drawers with wire gause bottoms and heated with steam. He also gives a method of preparing the solution of chloride of zinc, with some details as to its cost. He employs 5 or 10 lbs. of scrap zinc, a gallon of hydrochloric acid, and gets a solution with a specific gravity of from 1.5 to 1.62, which is increased by evaporation to a specific gravity of about 1.75. The solution costs, when thus made, about seven cents a pound.

When the solution becomes dark with coal dust he filters it through mineral wool.

Analysis of the Ash.—One-half of the sample is dried, then pulverized. The pulverizer consists of a cast iron cylindrical shell, with 16 chilled cast iron balls inside. The cylinder is revolved, and the sample pulverized in about three-quarters of an hour. The pulverized coal is quartered down to about one pint, which is screened on a No. 60 mesh sieve, 90 per cent. generally passing through; and that which does not pass through is crushed finer by hand on a rubbing plate. Where no machine is available for pulverizing, and the work must be done by hand, it is very important to crush the whole sample until it will pass through a sieve of No. 4 mesh, quarter down, then crush the retained portion until it will pass through a No. 10 mesh, then quarter and crush the retained portion until it will pass through No. 24 mesh, and so on until the last sample will all pass through a No. 60 mesh. No effort should be made to shorten the work by crushing the sample roughly, and screening it over a 60 mesh, and using what passes through for analysis. To show the discrepancies in analysis where rapid crushing is attempted the following table is given:

Size.	Proper method. Per cent. of ash.	Improper method. Per cent. of ash.	Difference, per cent.
Lump coal	5.00	6.65	1.65
Broken coal	7.52	9.97	2.47
Egg coal	8 50	11.12	2.62
Stove coal	8.39	10.15	1.76
Chestnut coal	9.50	12.87	3.37
Pea	11.45	14.95	3.50
Buckwheat	9 87	11.27	1.40
Rice	13.85	17.95	4.10
Barley	13.05	23.95	10.90

It will be observed that the difference was as much as 84 per cent. in the last case. The reason of this is probably that a large portion of the impurities in coal, such as iron pyrites, silica and substances of a clayey nature, occur in very light incrustations upon the surfaces of fracture of the coal. During the crushing a great deal of these very thin films is rubbed off in powder, so that the fine dust which passes through the 60 mesh sieve contains a very much larger portion of these impurities than the average coal.

Proximate Analysis of the Coal.—For commercial purposes, only an approximate analysis of coal is necessary; that is, an analysis by which the moisture, volatile combustible matter, and ash are determined; the carbon being determined by difference. It is occasionally necessary to determine the sulphur, and more rarely the composition of the ash, as the sulphur and the composition of the ash do not vary in the coal from one colliery as much as the percentage of ash. It is not necessary to determine the moisture and volatile combustible matter were it not that, without them, the amount of fixed carbon cannot be arrived at.

The sample which has been pulverized and quartered down is sent to the analytical room, where it is subjected to the following operations: (1) Determination of ash, (2) of moisture, (3) of volatile combustible matter, (4) of sulphur, (5) analysis of ash. The sample to be subjected to analysis is subdivided and a portion is burned in a light platinum crucible of special shape. The crucible is made shallow so that the sample can be spread in a thin layer, and the current of air or oxygen spread over it, and also that the incandescent mass can be easily stirred.

With these dishes, two grams may be incinerating by using natural draft, in about one hour, and the coal need be stirred only two or three times. In order to hasten the process, oxygen is used from tanks, at a very high pressure.

Moisture Determination.—This is done in a copper muffle made of sheet copper bent in the form desired and riveted at the joint, and open at both ends. This is held by two boards and is closed by a piece of asbestos board. The muffle is heated by three very small gas jets formed by making three small prefurations in ⅛-in. gaspipe. A thermometer shows the heat in the muffle. The temperature is kept at about 225 degs. Fahr., with but very little attention. The sample when weighed out is placed in the muffle, and remains at a temperature of 225 degs. for about one hour, experience having shown us that this time and this temperature are best suited for determining the moisture in our anthracites.

Determination of Volatile Combustible Matter.—The method usually adopted is to heat the sample in a deep covered platinum crucible for 3½ minutes by an ordinary Bunsen burner, and then, without cooling, for 3½ minutes more with a blast burner.

Determination of Sulphur.—This is done by Eschka's method, except that we use a different form of crucible, in the shape of a small-lipped and wire-rimmed beaker of platinum. By using a large crucible, all the operations of oxidation, acidulating, oxidizing with bromine, and driving off excess of the latter, etc., can be performed without transferring or washing the beaker, this saving considerable time.

This method is described in the *Engineering Record*, vol. XXVI., page 373.

Analysis of the Ash.—This, of course, is a comparatively long operation, and is done by the ordinary way.

Determination of Specific Gravity.—The method described was the usual one of weighing in air and then in water. The quantity used was about 20 lbs. There is a close relation between the specific gravity of coal and its percentage of ash. A careful study of a great number of analyses and determinations of specific gravity has led to the belief that the determination of the specific gravity of an average sample will give very nearly the same percentage of ash as will be determined by analysis, although the relation may not be the same for different mines or for different sizes of coal. If the specific gravity of the sizes below egg coal from a certain colliery are known and their average percentage of ash, the determination of the specific gravity of the coal will give approximately the percentage of ash by the following formula.

$$y' = y + (x' - x) \times a;$$

in which x = the standard specific gravity, x' = that of coal determined by our apparatus, y = the standard percentage of ash, y' = that of ash to be determined, a = a constant for coal for the same mine. The formula may require some modification where the percentage of iron pyrites is. It might fail if the character of the coal, slate or other impurities varied very materially. In the Lehigh region, for any size of coal, an increase of 0.01 in the specific gravity corresponds to about an increase of one and one-half per cent of ash; that is to say, that if coal of the specific gravity of 1.54 contained eight per cent. of ash the same size of coal from the same mine when its specific gravity was 1.56 would contain twice one per cent. more ash, or 11 per cent.

In all important boiler tests not only the coal used should be analyzed, and a special determination made of the moisture, but also the ashes should be carefully analyzed.

In the reports of many boiler tests only the name of the coal is given; such as Lehigh egg, Schuylkill stove, Wyoming pea, etc.; perhaps the name of the colliery may be added. Such information is not of very great value, as the quality and purity of these coals vary not only in the same region, but in the same mine from day to day. I have found nearly 60 per cent. of carbon in ashes from some boilers; and in some boiler tests which have

*Extracts from the President's Address at the New York meeting of the American Society of Mechanical Engineers, by Mr. Eckley B. Coxe.

been reported to me not much over 60 per cent. of the carbon actually in the coal seems to have been burned.

Under these circumstances it is misleading to say that so much water has been evaporated per pound of fuel. It is of very little importance how much water can be evaporated by a pound of combustible. What the man who pays for the coal wants to know—and he is the one for which the profession generally works—is how much water can be eveporated for $1 with different coals; and it is of no advantage to him to know that if he pays twice as much for his fuel he can evaporate five per cent. more water per pound of fuel, and get a wonderful theoretical evaporatiou from his boiler. The question is how much more you can get for $1 by using a certain coal, and it is very important to know exactly what kind of fuel is being used, whether it burned up, and whether it was artificially dried before it is put into the furnace.

Another question of very great importance is that of clinkering. It depends upon two points—the temperature at which the coal burns and the composition of the ash. The fact that a coal does not clinker may be due to its impurity; that is to say, the coal may be so impure that it will not make a fire hot enough to melt the ash, although the composition of the ash may be such that were it contained in a pure coal it would melt easily. On the other hand, the coal may clinker because it is very pure and burns at a very high temperature. The coal must have heat enough to fuse the silicates it contains. Generally the more bases there are in the ash the more fusible it is. Two coals, each of which burns without giving much trouble on account of the clinkering, may clinker more if they are mixed; the reason being that the composition of their joint ash is more fusible than either of the ashes separately.

Queen's Mercurial Pyrometer.

Messrs. Queen & Co., of Philadelphia, have within the present year put on the market a mercurial pyrometer for use in stacks, flues, stills, ovens, etc. This instrument is essentially a mercurial thermometer tube incased in a heavy brass case with glass front, as shown in the cut. The top of the tube is filled with nitrogen gas, which exerts a pressure, directly proportional to the increase of temperature, upon the mercury, causing it to expand regularly to a very high degree of heat, the makers guaranteeing 800 deg. Fahr. This is a gain of 200 deg. over the ordinary forms of thermometers, whose tubes contain a vacuum, in which mercury becomes volatile at about 600 deg., and at a point where accurate measurements are greatly needed, as in the making of boiler tests, tempering metals for guns, taking stack temperatures, etc.

This mercurial pyrometer is strong and legible, and can be constructed to meet almost any requirements. Its great accuracy and the permanency of the scale readings (which will not change with age) should recommend its use for high temperatures.

The Erie Engineers' Locomotive.

There has been some discussion caused by the fact that the engine which was designed by the engineers of the Erie and exhibited at the Fair has 88,750 lbs. on the driving wheels. It has been suppo ed that engineers who have been delayed by hot driving journals, as all engineers have been, would use care in designing a locomotive to have the weight so distributed as to cause the least possible amount of heating.

It has not been pointed out that the bearings of this engine are large, 8½ × 12 in., and that the weight on each square inch of bearing surface is not excessive; it is not as large as in the case of the New York, New Haven & Hartford engine exhibited by the Rhode Island Locomotive Works. The weight on each square inch of bearing is about the same as that of the C., B. & Q. Class M, exhibited by the Rogers Locomotive Co., the C. R. R. of N. J. engine exhibited by the Baldwin Locomotive Works, or the C., M. & St. P. ten-wheel engine with trailing truck exhibited by the Rhode Island Locomotive Works, all of which are to be used in fast passenger service.

The objection, then, to the weight on drivers of the Erie engineers' engine is not one to be raised by the motive power department, but rather by the maintenance of way department. The weight on drivers is about 5,000 lbs greater than that of two or three other American type engines exhibited by designers who have had more experience in designing than the Erie engineers; it is about 5,000 or 6,000 lbs. less than that of the Pennsylvania's new compound passenger engine. The weight allowable on each wheel depends on the amount of journal bearing surface that can be obtained, and the condition of track over which the engine is to run. It has been shown above that the bearing surface is ample, so if the track over which the engine will run is laid with sufficiently heavy rails the weight on drivers will not be found excessive.

The boiler of this engine is large, 66 in. in diameter, and the firebox is of good length, 126 in., and these give the large weight on drivers. The engineers are to be commended for their attempt to provide large grate and heating surfaces. There is no doubt that with properly adjusted draft appliances the engine will steam freely and show much economy over many other engines in the use of fuel.

An engineer rides much of the time with his head out of the cab, and in such a position he is very liable to get cinders in his eyes and in winter to suffer more or less with the cold; to prevent the former and to lessen as much as possible the letter, this engine is provided with a narrow window projecting out from the side of the cab and just in front of the engineer's face when his head is projecting from the cab window. This prevents cinders and dust from reaching his eyes and in cold weather does not frost over, obstructing the view, as the cab windows do, or if it does the engineer can easily and quickly wipe it off. Usually the front window will frost over in cold weather, and to remove it the door must be opened, and if the door opens outward the engineer must step onto the running board to reach the window. This device, however, is not new to this engine, being used on a large part of the locomotive equipment of the Erie, but it is a device that might well be used more generally than it is, and be adopted by other roads.

MAIN FEATURES OF SWISS RACK RAILROADS.

	Vitznau-Rigi.	Goldau-Rigi.	Schynige-platte.	Wengern-alp.	Pilatus.	Generoso.	Rothhorn.	Glion--Naye.
Length, feet	22,495	28,400	25,714	5[illegible],751	24,000	29 496	24,928	25,190
Difference in altitude between stations, feet	4,297	4,057	4,592	4,149	5,313	4,330	5,514	4,208
Altitude of upper station, feet	5,740	5,746	6,462	6,770	6,783	5,235	7,386	6,468
Maximum grade, per cent	25	20	25	25	48	22	25	22
Average grade, per cent	19	15.3	19.17	14.1	38.13	14.66	22.12	16.6
Gage	4 ft. 8½ in.	4 ft 8½ in.	2 ft. 7½ in.	2 ft. 7½ in.	2 ft. 7½ in.	2 ft. 7½ in.	2 ft. 7½ in.	2 ft. 7½ in.
Least radius of curvature, feet	393½	593½	196.8	196.8	262 4	195.8	196.8	262.4
Length of iron bridges, feet	255	108—98—98	98	82—114	None	62	72—147—33	79—29
Tunnel lengths, feet.	220	128—2 7—134	524—492—82—65	80	128—154 318 131—1 4—114 33	511—295—213 —131—82	62—390—147— 292— 295 — 56 — 160 — 305— 121—438	226—476— 246—279— 804
Date of opening	May 23, 1871	June 3, 1875	June 14, 1893	June 20, 1893	June 4, 1889	June 1, 1890	June 15, 1892	July 22, '92
System of racks	Riggenbach	Riggenbach	Riggenbach	Riggenbach	Locher	Abt	Abt	Abt
Number of locomotives	10	5	4	8	9	6	4	6
Weight of trains, lbs.	56,100	66,000	5[illegible],330	55,440	25,300	52 360	53,680)	53,680
Service weight of engines, lbs.	34,760	38,500	36 ,300	36,300	20[illegible],40	31,900	36,520	35,200

Tne Wengernalp Mountain Railroad in Switzerland.

Of all the Swiss mountain railroads none, it is said, is equal to that of the Wengernalp, either in scenery or in structural features. From the top of the mountain, the Jungfrau, the Eiger and other great peaks are seen close at hand. An account of the Wengernalp road by Mr. E. Strub appeared in the *Schweizerische Bauzeitung* a short time ago, in which he gives the history of the undertaking and details of the construction, with several illustrations of the cars and locomotives used, profiles and plans of the line, etc.

The preliminary surveys for the road were made during the summer of 1890, and actual construction work was begun early in the year following, and the line was ready to be given over to traffic in June of this year. The maximum grade is 25 per cent. on a little over one-tenth of the total length of the line, the average grade being slightly over 14 per cent., while the minimum is 3 per cent. The gage is the one which has been generally adopted since the building of the Pilatus road, which was opened in 1889, 80 cm., or, approximately, 32 in. While this has been found to be quite satisfactory, there seems to be a growing impression that a 36-in. gage would have been still better as regards stability, and would have been equally economical in point of material necessary. The position which has been taken by some that the narrower gage afforded a greater degree of elasticity, in permitting readier adaptation of a line to the prevailing contours, permitting shorter radii of curvature, etc., Mr. Strub considers questionable, while, on the other hand, he thinks that the broader gage would, undoubtedly, give greater safety against wind pressure, promote steadiness of running, and reduce the wear and tear of rolling stock and track material.

The cars used are like those of the several other Swiss mountain railroads, being of the half-open variety, with curtains at the sides to afford some protection against wind and rain. In fact, the design is much the same as that adopted years ago for the early Rigi road. Each passenger car has four axles and a platform at one end. There are two second-class compartments with 16, and four third-class compartments with 32, seats. Each car has two 18-in. steel pinions, with 14 teeth, gearing with the rack-rail. It is specially interesting to note the degree of stability which the cars have against wind pressure. While bridges, factory chimneys and other similar structures exposed to possible high wind-pressures are, according to Mr. Strub, proportioned to resist from 25 to 55 lbs. per square foot, the limit of safety against overturning with some of the long, narrow rack-rail cars is reached at pressures of from 14 to 20 lbs. per square foot. In building the Pilatus road, Col. Locher, the engineer, provided for a maximum wind pressure of about 40 lbs. In the case of the Wengernalp road, however, Mr. Strub calculates that the cars, unloaded, would be overturned with a pressure of only about 18 lbs. per square foot, with the curtains closed. Rules have been issued by the management of the line that in cases of high winds all the curtains must be drawn back so as to reduce the resisting area, and in special instances the running of the trains must be discontinued.

In addition to the cars already mentioned there is also in use a smaller closed car, with two axles, having two passenger compartments with accommodation for 16 people, and an open baggage compartment capable of holding 12 people. This last compartment has folding seats. There are, further, two open freight cars of six tons capacity each.

The locomotives are of the Abt system, like all those used on the Swiss narrow gage track roads. Each engine has two driving pinions, an air-brake, a steam brake and two driving pinion brakes, one on each side of the locomotive cab. With heavy trains the air-brakes are not sufficient to control the speed, hence the auxiliaries. The steam brake is thrown into gear by a centrifugal governor whenever a set limit of speed is exceeded. The locomotives have a service weight of 16½ tons and a tractive power of 6.8 tons. On a 25 per cent. grade they are capable of hauling a 26½-ton train at a speed of about 4½ miles an hour. Communication between the several stations is maintained by telegraph, this having been preferred to the telephone on the score of greater reliability.

The contractors for the road were Messrs. Pümpin & Herzog, who also built the Schynigeplatte line; Mr. Hittmann served in the capacity of chief engineer, and Messrs. Greulich and Koller acted as superintendents of construction. In connection with the subject the accompanying condensed table will prove interesting, giving some of the main data concerning the various Swiss mountain railroads, which are rack roads pure and simple.

Electric Water Power Plants in Italy.

In a recent issue of *Les Annales des Travaux Publics* particulars are given of the operations of the Société de l'Acquedotto de Ferrari-Galliera in establishing electric water power installations near Gênes, where vast quantities of water have been stored by damming one of the valleys and thus creating large artificial lakes. These are at an elevation of about 1,830 ft. above the town, and in order to profitably utilize the power the total head was subdivided by the establishment of three intermediate power stations and reservoirs at different levels. The first of these stations works under a head of about 370 ft. of water, affording about 746 H. P.; the second has a head of about 355 ft., giving 720 H. P.; and the third has a head of about 472 ft., yielding in the neighborhood of 960 H. P. The greatest distance to which the current from these stations is now carried is about 19 miles.

At present the current is used only for power purposes, the constant-current system being employed, and the various motors at different points along the line being connected in series after the manner of the currently practised arc-lighting systems. The voltage, therefore, as will be readily understood, is a variable factor, ranging from about 450 or 500, which is necessary to overcome the resistance of the line when none of the motors are running, to as much as 5,000 or 6,000 at the times of greatest power consumption. With such wide, and at times very sudden, changes in potentiality the regulation of the motors offered problems of special study which appear to have been solved in a satisfactory manner.

The first station at present comprises two dynamos or generators, developing together 140 H. P. and driven direct by a turbine working at a maximum speed of 475 revolutions per minute. Elastic couplings of the Raffard type are used. The dynamos are of the Thury pattern, have six poles each, and at maximum load deliver a current of from 1,000 to 1,100 volts and 47 amperes. The speed of the generators varies between very wide limits, according to the voltage to be supplied, regulation being effected by hand.

The second station is equipped with four turbines, each of 140 H. P., and each coupled with two generators like those first mentioned, the field magnets being excited in series by a separate dynamo, which is independently driven by a special turbine. The third station is designed to accommodate six turbines of 140 H. P. each,

two generators again being coupled to each wheel, and each generator being intended to furnish a maximum current of 1,000 volts and 45 amperes, working at 475 revolutions per minute. All the generators are coupled in series.

The current transmission lines are copper wires, 9 millimeters, or about 0.36 in., in diameter, carried on oil insulators on ordinary wooden poles, which, about half way up, are provided with iron prongs or barbs to prevent unauthorized persons from climbing up. There are also printed notices warning the public against coming in contact with the wires.

The motors, which are supplied with current at different points along the line, are all of the Thury pattern, ranging from about 5 to 60 H. P. The smaller motors, ranging from 5 to 18 H. P., are of the two-pole type, while the larger ones, from 18 H. P. up, are multipolar, the number of poles varying from four to six. The actual length of line now in operation is 60 kilometers, or about 37 miles, absorbing, in round numbers, about 500 volts to overcome its resistance.

The whole installation, according to our contemporary, affords an admirable solution of the problem of successfully transmitting high-tension, continuous currents and utilizing them on the series system. The minimum, 6,000 volt currents, now used at Gênes, do not, moreover, imply that the full limit of high-tension according to this system has been reached, and it is intended to soon further increase the voltage to 10,000 by putting in additional generators.

TECHNICAL.

Manufacturing and Business.

The converting department of the newly erected steel plant of the National Tube Works is about ready for the test, after which the plant will be put in operation.

The American Coupler Company, of Chicago, has moved its office to 409 Western Union Building, Chicago.

Charters were granted at Harrisburg, Pa., on Nov. 29 to the Spruce Run Bridge Co., of Pittsburgh, $6,000 capital stock, and the Audible Electric Block Signal Company, of Camden, N. J.

The Ensign Manufacturing Company, Huntington, W. Va., is building Russell snowplows for the Rome, Watertown & Ogdensburg, the Western Maryland and the New York, Susquehanna & Western.

The machine shops of the Pennsylvania Railroad at Altoona, Pa., which have been working only five days a week and nine hours a day for the last three months, started up on full time this week.

The Detroit Bridge & Iron Works last week filed a new charter with the Secretary of State of Michigan, with a capital stock of $300,000.

The Wason Car Shops, at Brightwood, Mass., closed on Dec. 4, throwing 250 men out of employment. The company has been working on an order for cars from the Manhattan elevated, which has just been completed.

The agreement prepared by the Committee of Creditors for the rehabilitation of the Gilbert Car Company is reported to have been signed by 95 per cent. of the creditors.

The Wharton Switch Works, at Philadelphia, which were closed in all departments last week for the first time in many years, are again in full operation.

The Ajax Metal Co., of Philadelphia, has added to its present plant a large machine shop and laboratory and will make bearings, acid metal and fittings of every description of Ajax metal. The laboratory will be in charge of a thoroughly competent officer, a graduate of the University of Pennsylvania, and will be made an important branch of the company's business.

The Wuerpel Switch & Signal Co., of St. Louis, has made a voluntary assignment to William K. Bixby, of St. Louis. The liabilities are estimated at about $98,000. The assets consist chiefly of the plant in East St. Louis, which has been closed for some months, various patents owned and the equity of redemption in the World's Fair contract, valued by the officers at $20,000.

The Gilbert Car Mfg. Co. has renewed a chattel mortgage given to the Atlantic Trust Co. of New York a year ago for $70,000.

The Rome Locomotive & Machine Works at Rome N. Y., were nearly entirely destroyed by fire this week. The loss is estimated at $500,000 with insurance for $300,000.

William K. Ackerman and James H. Wilson, assignees of the Grant Locomotive Works, offer for sale the entire property of that company in the town of Cicero, near Chicago, subject only to first mortgage of $200,000 issued in 1892, and a mortgage of $17,500, the proportionate part of the land mortgage. The plant is quite new, having been completed in July, 1892. The buildings are of brick, and the lighting, heating and ventilating apparatus have been very carefully planned. The buildings include a machine shop 110 × 342 ft., equipped with machinery sufficient to finish three engines a week; erecting shop 82 × 301 ft., with a 40 ton electric crane; a blacksmith shop 80 × 225 ft., equipped with four steam hammers; hammer shop 80 × 131 ft.; boiler shop 120 × 243 ft., equipped with fine hydraulic and compressed air plants and all necessary tools for a first class boiler shop; a flange shop 51 × 72 ft.; wood shop 70 × 202 ft.; foundry 80 × 262 ft.; a cupola-room containing two Byram colliau cupolas, with brass foundry 40 × 60 ft. The office building is 45 × 90 ft., two stories in height. There are four electric cranes in the various shops with a capacity from 10 to 40 tons. The plant is situated on 30 acres of land, with track connection with the Belt Line Railroad, and the company also owns an additional 30 acres of land adjacent to the shops. The material now on hand is valued at $60,000, and in addition material finished in whole or in part for 22 engines for the Chicago, Burlington & Quincy is worth $98,000, the total stock on hand amounting to $158,113. The assignees will receive proposals up to Jan. 15, at their office, No. 100 Washington street, Chicago.

Iron and Steel.

The sale of the steel plant at West Superior, Wis., has again been adjourned for one month, and is now set for Jan. 2.

Operations in all departments of the Edgar Thomson Steel Works, at Braddock, Pa., were resumed Dec. 4 after two weeks' shutdown.

The Maryland Steel Co., Sparrow's Point, Md., shipped over 1,200 tons of rails last week by boat to Savannah, Ga., to be used on the Florida Central & Peninsular Road.

The Locust Point Iron & Steel Works, at Canton, Baltimore, Md., have been sold at trustees' sale for $25,000.

A meeting of the creditors of the Pennsylvania Steel Company and the Maryland Steel Company was held in Philadelphia on Nov. 29. Mr. Wayne MacVeigh counsel for the company, made a statement, giving the present financial status of the company since the failure of the proposed scheme of reorganization, which provided for the issue of $6,000,000 of bonds to provide for the floating debt. He stated that the works were operated at a profit for some time after the Receivers were appointed, but that lately they have been earning very little. The result of the meeting was a decision to appoint a committee of seven to represent to insecured creditors, who are to confer with a committee of five, appointed by the stockholders on Nov. 21, to formulate a plan for the rehabilitation of the two companies.

New Stations and Shops.

The Pittsburgh, Cincinnati & St. Louis is to erect a new two-story brick and stone station building at Pittsburgh, next year.

The International & Great Northern is to erect a new station at Tyler, Tex., to cost about $25,000.

Mallet Compound Locomotives.

The 10 duplex compound freight locomotives (system Mallet), mentioned in our issue of Nov. 3, are being delivered by the Maffer Works in Munich to the Swiss Central Railroad. Their principal dimensions are:

Diameter of driving wheels	47¼ in.
Diameters of cylinders	13¾ and 21¼ in.
Stroke of piston	24 in.
Steam pressure	206 lbs.
Total heating surface	1,145 sq. ft.
Grate area	17.2 sq. ft.
Water supply	1,900 gal.
Coal supply	7,250 lbs.
Weight in service	132,000 lbs
Weight empty	100,000 lbs.
Maximum axle pressure	53,000 lbs.
Total length	34 ft. 1½ in.
Rigid wheel base	5½ ft.
Total wheel base	18½ ft.

The number of locomotives of this pattern on the Swiss railroads is hereby increased to 25, of which 8 are for meter gages. For a description see the *Railroad Gazette* May 5, 1893.

Soft Steel in Bridge Work.

The specifications of the New York, Lake Erie & Western have recently been altered to permit the use of soft steel without reaming instead of iron, provided equal sections are used and the physical tests show the following results: Ultimate strength 54,000 to 62,000 lbs. per sq. in.; elastic limit not less than 30,000 lbs. per sq. in., and a minimum elongation of 20 per cent. in 8 in.; also the usual bending test, 180 degs., before and after heating to a light yellow and quenching in cold water to a curve whose inner radius is equal to the thickness of the specimen, without sign of fracture. However, medium steel is still required for eye-bars and pins.

Another Mississippi Bridge.

It is reported that soundings are being made at Carondelet, Mo., in the southern part of St. Louis, for the purpose of building another bridge across the Mississippi River to connect with the Ohio & Mississippi Cairo Short Line, Louisville & Nashville and other railroads.

The Hurontario Canal.

The Hurontario Ship Canal project has been pronounced impracticable by Mr. Thomas C. Keefer, of Toronto, ex-President Am. Soc. C. E, who points out that the scheme contemplates having a summit level cut of about 10 miles of continuous cutting, averaging 99 ft., and being nearly 200 ft. in depth at the deepest place. Without taking into account other questions, adds Mr. Keefer, this cutting alone stamps the whole enterprise as commercially impracticable. Engineers know the danger of encountering slides in the material, and in some cases a tendency in the cutting to close in on both sides and destroy all the work that has been accomplished. Mr. Keefer continues: "For the summit level cutting of the Huron and Ontario Canal, with the certainty of trouble from water and quicksand, the difficulties and amount of money required for the execution of the work would be simply impossible to estimate. The only parallel for this summit level cut is to be found on the abandoned Panama Canal, where the Culebra cut, intended to be about the same length and depth, stands partly excavated to not more than half its depth."

A Big Engine.

The Dickson Manufacturing Company, of Scranton, Pa., has just completed one of its Van Vleck quadruple expansion engines for the Edison Illuminating Company, of New York City. The engine weighs 400,000 lbs. and is of 2,500 h. p. It will make 90 revolutions a minute. It has two crank tandem cylinders, one high pressure and one low pressure. The dimensions of these cylinders are 26 × 37, 52 and 72 × 36. The engine has the Joy valve gearing, with piston valves controlled by hydraulic governors. The crank shaft is of steel forging and weighs of itself 30,000 lbs. Armatures are to be placed on each end of this shaft when the engine is placed in position in the electric light works. It is said to have taken a year to put this piece of mechanism together, and now they are taking it apart, marking each portion so that the Edison company will know just where each piece belongs. It is to be set up complete before the middle of December.

A Decision as to Royalties.

A decision recently handed down by the Appellate Court in Chicago will affect greatly manufacturing and other industries of this country. The Goodyear Shoe Machinery Co. owns patents on machines which are extensively used in the manufacture of shoes, and until recently another company claimed patents on devices used by the Goodyear company. Awaiting the outcome of the proceedings in court that were brought against the Goodyear company for infringement, the shoe manufacturers of Chicago demanded that the Goodyear company furnish bond to protect the users of machines against loss should the courts decide that the Goodyear company was renting devices which belonged to another company. This the company refused to do and the shoe manufacturers refused to pay the royalties. The case was carried to the Appellate Court, the shoe manufacturers claiming in effect that the amount was a usurious penalty. The decision of Judge Clifford is in favor of the shoe manufacturers. This is a far-reaching decision and no doubt will affect royalties amounting to great sums.

The National Switch & Signal Co.

Mr. Charles Hansel has been made Western Manager of the National Switch & Signal Co., with office in the Monadnock Building, Chicago. He has control of all territory west of Pittsburgh. He is now arranging a working display of the apparatus of the company, in which there have been some recent improvements in details. The apparatus shown in his offices will be complete interlocking outfit and the Palmer torpedo placer and the Lattig electric semaphore. Mr. Hansel will be remembered as having been the Consulting Engineer of the Illinois Railroad & Warehouse Commission for three or four years, when he formulated the standards and rules governing interlocking in Illinois, and during that service he was sent to Europe to inspect methods of signaling and also as Honorary Commissioner to Europe for World's Fair. Before that he was for six years on the Wabash, three years Chief Engineer east of the Mississippi. For five years before that experience he was on the Denver & Rio Grande, on location and construction. It will be observed that he has had practical railroad experience and special experience as a signal engineer to fit him for the place he now occupies.

Transmission of Power by Compressed Air in Chicago.

In the last issue of this journal it was said that the Chicago Power Supply & Smoke Abating Company had requested from the Department of Public Works a permit to lay, in the streets of the city, pipes for the transmission of power by compressed air. The company was granted an ordinance two years ago, and the activity at present is to save the company's ordinance, which requires that three miles of pipe line be laid by February, 1894. The company was granted the permit and is now laying pipe on the West Side. The pipe is of wrought iron, 4½ in. in diameter, and Mr. Bacon, the promoter, says that the air pressure will be 90 lbs., and that at this pressure, and through the 4¼-in. pipe, 1,000 H. P. will be transmitted.

Coal for Locomotives on the New York Elevated Railroad.

The *Coal Trade Journal* of last week has an illustration of the coal handling apparatus of the Manhattan Elevated Railway at Second avenue and 129th street, New York city. It is an iron structure about 60 ft. high, built in the style of the structure supporting the elevated railroad tracks, and it has a capacity for unloading about 600 tons each day of 10 hours. The traveling crane on the top of the structure has an arm reaching out 38 ft., and the height of hoist from the boats in the Harlem river adjoining is 80 ft. The apparatus, including the automatic steam shovel, hoisting engine and cars, was furnished and put up by the C. W. Hunt Co.

The Manhattan road uses from 200,000 to 225,000 tons of coal (anthracite) a year. For the last two years this has been furnished by the Philadelphia & Reading Coal & Iron Co. The coal is broken white ash; it is brought from Port Reading in boats, and besides the station mentioned deliveries are also made at Pier 1, North River, and at 159th street and the Harlem River.

A New Storage Battery Car.

A new storage battery car made by the Globe Storage Battery Co. has been running a few days on the new Twenty-second street line of the Chicago General Street Railway Company. It is taken under a four-months trial, and if it proves a success the entire overhead system will be abandoned and the line equipped with these storage battery cars. The new car was built by the Pullman company and is furnished with improved Peckham trucks. It is claimed by Mr. H. C. Porter, the manager of the Globe Storage Battery Co., that this car will run 125 miles without recharging, and that the batteries, instead of wearing out rapidly, will grow stronger with use, the batteries in the car now in operation having been used continuously for four months. The cost of changing an ordinary trolley car to the storage system will be about $300.

The Rainey Bridge.

Mr. Austin Corbin has secured control of and intends to begin work upon the Blackwell's Island Bridge, well known as Dr. Rainey's project. The charter for this bridge was obtained in 1867 under the name of the New York & Long Island Bridge Company, but it has been renewed and amended at various times since (*Railroad Gazette*, 1892, pages 120 and 137). The limits of the bridge for spanning the river are Thirty-second and Nineteenth streets, and the proposed terminus is near Forty-fourth street, east of Fourth avenue, and will connect with the New York & Harlem Railroad and also with the East Side elevated. The charter was approved by Congress and it will bring the Long Island Railroad into New York.

The Palisades Tunnel.

Remarkably good work in hard rock tunnel driving is now being done on the Palisades tunnel of the New York, Susquehanna & Western Railroad near New York. This work has been under way about a year, and it is expected that the tunnel will be completed early in 1894. During the past month the contractors, Messrs. Broadhead & Hickey, drove on the east end of the tunnel, which is in charge of Mr. P. F. McLaughlin, 161 ft. of heading and 186 ft. of bench, all double-track tunnel, dimensions 27 ft. × 21 ft. The record in the heading is especially remarkable owing to the fact that the work was done by night shift only, that is, only one shift in 24 hours. This plan was first introduced by Mr. McLaughlin, and has proved so successful that it has since been adopted elsewhere. One of the main advantages of the single shift is that after the drilling and firing, which takes place early in the morning, common muckers are put to work in the heading to get rid of the broken stone, and the man in charge of these muckers sees that the columns are put up and the drills in place for the runners to begin drill work again on the following night. The rock encountered is Jersey trap, known to be one of the hardest rocks in existence. This work has been done with four Ingersoll-Sergeant F-2 drills in the heading and six on the bench.

THE SCRAP HEAP.

Notes.

The Norfolk & Western has issued an imperative order that all employees shall be vaccinated.

Ohio papers report that 3,000 work-train men have been discharged by the Pittsburgh, Fort Wayne & Chicago.

Some clerks in the office of the General Superintendent of the Lake Shore & Michigan Southern have been detected in selling passes on a large scale.

On the night of Dec. 2 three highwaymen took possession of the station of the Chicago & Northwestern at Luzerne, Ia., and after robbing the agent, operator, several freight train men and passengers, locked them up in the freight room. The robbers secured about $800. They were finally driven off by the passengers of a train which arrived.

Carloads of unemployed men continue to ride free on freight trains in California now and then. At Woodland, the other day, a gang of 150, who said they came from Idaho and Montana, stopped off and enjoyed free lodgings for a night in the city hall. Near Los Angeles, a company of 40 were driven off by the railroad men, and some of them arrested.

The cable railroad in Broadway, New York City, is to be equipped with an electric circuit for conveying signals to headquarters and to the power-house. The wire will be run in the underground conduit, and signal boxes, sunk in the pavement and covered by an iron box, will be located from 500 to 700 ft. apart throughout the line. By means of a dial instrument a conductor or inspector can signal to have the power shut off or send any one of a half dozen other messages which the apparatus is prepared for.

South American Notes.

The Municipal Council of Paaá, Brazil, has authorized the use of electricity as a motive power for the street car lines of that city.

The Argentine Board of Public Works has approved the plans of the Trans-Andine Railroad for the Abt system on a part of its line.

The republic of Uruguay has established a national department of engineers. Difficulty has been experienced in filling all the posts in this department, owing to the incompetency of applicants.

The commission recently appointed to consider the lighting of the coast of Chili has recommended the construction of 22 new lighthouses, 10 of which are to be in the Straits of Magellan. These lighthouses are to be finished within four years.

The firm of J. S. Morgan & Co. has been commissioned by the Argentine government and by the guaranteed railroads to arrange a basis of settlement of the accrued guaranties on the capital invested in those lines. It is thought a compromise will be effected on a sum of about $1,500,000.

The report of the La Guayra (Venezuela) Harbor Corporation for the first half year of 1893 shows a gross income of $240,000. As the estimated expenses for the year are $215,000, the company will enjoy a very considerable net income, and will be able to declare a dividend for the first time since its organization.

A line of steamers between Ceará, Brazil, on the Atlantic coast, to Manáos, 1,000 miles up the Amazon River, is soon to be started, enjoying a subsidy of $25,000 a year from the State of Amazonas. One object of the enterprise is to facilitate the importation of laborers from Ceará for work in the rubber districts.

The Chilian Government has asked for tenders for a steamship line between that country and Europe, touching at La Plata and Brazilian ports. The service must be monthly, the vessels to be of not less than 4,000 tons, capable of a speed of 15 knots an hour. Bidders must specify the amount of subsidy required in gold dollars. The contract will be let for five years.

It is stated by the Panama *Star and Herald* that the Central & South American Oriental Commercial Co., of San Francisco, has closed contracts for sending 30,000 Chinese laborers to planters in Spanish America, as well as a contract for 10,000 Chinese and Japanese to be sent to Peru. The company is to receive $100 for each Japanese, and $150 for each Chinese laborer.

The report of the Buenos Ayres Western Railroad for the year ended June 30 shows a gross revenue of $2,800,000, and as the operating expenses have only been 42.63 per cent., this leaves a net income of $1,602,360. A change from sheep raising to wheat farming along the line of this road has increased the tonnage carried from 315,000 tons in 1891-92 to 493,000 tons in 1892-93

The Buenos Ayres Western Railroad has just completed its extension from Bragado to Lincoln, 65 miles, at a cost of £167,000 (a little less than $13,000 a mile), one of the cheapest roads built by Englishmen in South America. The original estimates of cost for this extension were £200,000. This branch line is now being continued from Lincoln to Lavalle, a distance of 22 miles. The estimates for this work are $350,000.

The contractors for the Trans-Andine Railroad between Argentine and Chili, having found it impossible to raise funds to complete the line on the basis of the existing concessions, have asked the Chilian Government to increase the interest guaranty from four to five per cent. Only 20½ miles remains unfinished. The Argentine section will be completed within the next six months, leaving only about nine miles, consisting largely of tunnel work, to be built.

The Copiapó Railroad Co., of Chili, in its annual report, shows a considerable increase over 1891-92 in the tonnage carried, the improvement being chiefly in copper ores, coal and silver ores. The gross income, however, is about $10,000 less than in the previous year. The working expenses, which were 73 per cent. of the revenue, had been reduced, so that the net income had augmented from $117,700 to $149,480. The company has declared a dividend of four per cent.

The report of the Buenos Ayres Great Southern Railway for the year ended June 30, 1893, shows a gross revenue for the year of $5,250,000, an increase of $450,000 over 1891-92, yielding an increased net profit of $155,000. The tonnage carried was 806,228 as against 667,225 in the previous year. The number of passengers carried was 2,444,300, against 2,174,707 in 1891-92. This increase the company attributes to a reduction in fares. The number of passengers carried per annum has doubled in the past 10 years. The length of this line is now 1,388 miles, including all branches.

The Uruguayan Chamber of Representatives has sanctioned the bill granting to Messrs. Moulié & Cibils a concession for waterworks at Salto and Paysandú.

Owing to the lack of funds the Chilian government has discontinued the construction of various railroads which had been projected in that republic. As a result a considerable portion of the work done on these lines has suffered partial destruction. The newspaper press of Chili is urging the continuation of these works without delay, and it is said that the government will endeavor to resume active railroad building within the coming year.

From official figures of the Argentine Government the imports from and exports to various countries for the first six months of 1893 were as follows:

	Imports.	Exports.
Great Britain	$16,010,604	$13,900,496
France	6,109,138	14,715,203
Germany	5,798,023	8,424,979
Belgium	4,774,646	8,813,813
Brazil	1,038,133	9,211,824
Italy	5,069,120	1,822,025
United States	3,573,620	2,229,075
Various	4,906,396	11,070,468
Total	$47,579,680	$70,217,883

The Chilian congress has voted $150,000 to defray expenses of the Mining and Metallurgical Exhibition to be held in Santiago in September, 1894. The exhibits are desired to embrace motive power, electricity, mining and crushing machinery, metallurgical installations, chemical industries, statistics and plans, and mining and metallurgical products. The Chilian government offers to pay the cost of conveyance, by sea and land, of all exhibits, and in case the exhibits are not sold in Chili, the government will also bear the expenses of returning them to the exhibitors. In addition the government will pay the passage money both ways of the operatives and workmen necessary to take out, erect and run the machinery exhibited. Motive power, tables, showcases, etc., will be provided free of cost at the exhibition. No duties are levied unless the exhibits are allowed to remain one year in Chili. Application for space must be made to the Chilian legations in Washington, Paris or Berlin.

One of the biggest enterprises seriously proposed in recent years is that for a grand transcontinental railroad beginning at Pernambuco, Brazil, and terminating at Valparaiso, Chili. Of course, no surveys have been made, otherwise the promoters would not be content to limit their estimates to $150,000,000. The larger part of the region which would be traversed is only imperfectly known from the reports of explorers, who have as a rule been concerned more about ethnology, botany and zoölogy than about the feasibility of railroad construction. As a matter of fact, the progressive Mogyana Railroad of São Paulo, having a connection through the Central Railroad with Rio Janeiro, has gradually being pushing westward, and will ere long reach into the State of Goyaz. The telegraph has pushed on past the capital of Goyaz, and will soon reach Cuyabá, almost at the western confines of Brazil. These things show the demands of trade, and as need requires the railroads will go forward, and a transcontinental line across Brazil may result in time. It is strange, however, that a scheme for a Pernambuco-Valparaiso trunk line should have even gained a hearing.

Camels in Australia.

For some years efforts have been made to introduce camels into Australia. They have proved valuable in the interior, particularly in maintaining the overland telegraph line, and they carry large loads on very cheap food. Nothing, apparently, can be urged against them as an appliance for transportation, but there is a prejudice against them that is leading to opposition, and a Mr. Waddell, of New South Wales, has presented a bill in the assembly of that colony providing that "no person shall conduct or in any way use as a beast of burden any camel on any public highway" within a mile of any town containing 100 inhabitants, under penalty of £10 for the first offense and not more than £20 for any subsequent offense; and from his place on country platforms and in Parliament Mr. Willis, M. L. A., says, with emphasis, "The camel must go."

The Sydney *Mail* voices the prejudice against the "ship of the desert" in the following sentence: "The brute frightens horses, and impregnates the atmosphere with a malodorousness thought to be the sublimated essence of all Asia as far as the Chinese Wall." There seems also to be doubt as to whether the brute or the Afghan driver is the more pungent. Probably the "cart vote" is bigger than the "camel vote." As to the "malodorousness" of the camel—that is a matter of taste. A little boy whom we know writing of goats said: "Some folk think goats smell bad; I like it."

A Ship Canal Between Chicago and Toledo.

The question of ship canals is popular in the daily press and the newspapers are building canals to such an extent that if all of the schemes could be carried out the United States would become an immense Venice. Now the Chicago papers are proposing a canal to connect the south end of Lake Michigan with the west end of Lake Erie at Toledo. The total length would be about 140 miles, and it is estimated that the cost would be about $50,000,000. It is claimed that the saving in freight charges alone, were such a canal constructed, would pay 5 per cent. on the cost of the canal, to say nothing of saving many wrecks. The canal proposed for Baltimore would bring that city 200 miles nearer the European markets than it is at present, while it is said for the proposed Michigan canal that it would bring Chicago 550 miles nearer the Atlantic coast, besides removing entirely the dangerous passage around the Michigan peninsula.

The Indian Mails.

The *Railway Official Gazette* states that there is again some talk of the mails for India, from London via Brindisi, being carried through Ostend and Belgium instead of through Calais and France as at present. The cause of the dissatisfaction with the route through France is that the French Government charge about £60,000 per annum for passage through the country in addition to payments to the railroad companies for transportation. This "wayleave" is considered onerous, and in addition the route through Belgium and Germany is through a country thought more friendly than France. The additional distance and time required for the Belgian-German route, notwithstanding great improvements in the Ostend boat service, will probably continue the mail and express passenger service in its present channel.

The rather famous "club train" between London and Paris is said, on the same authority, to have carried in the 1,580 days it was running, 39,500 passengers. The daily mileage was 674½, so that it ran 27 miles for each passenger. The London, Chatham & Dover claims a loss of £20,000 on boat service.

New Canadian Pacific Station in Montreal.

The Canadian Pacific has submitted to the Montreal City Council plans for the new East End Station in Montreal. The city agrees to purchase the land necessary for the station and a hotel fronting on Craig and Berri streets, and running 300 ft. east from that street, if the company will build the station and hotel and have all its trains run into that station. The city will further agree to bridge Notre Dame street over the tracks of the railroad, the company deeding to the city other land which it owns in the city. The proposed hotel will cost $350,000. The depot itself will be larger than both the Bonaventure (Grand Trunk) or Windsor (Canadian Pacific) stations. The whole work will, if carried out, entail an expenditure of over a million dollars.

Forty-three Passengers Killed by a Train Accident in Italy.

A press dispatch from Rome, Nov. 29, reports a collision between a passenger train and a freight train at Melzo, a town in Lombardy, 12 miles northeast of Milan. The collision occurred the middle of the night and the wreck caught fire, it is said, from the lamps, the flames spread rapidly, burning many of the victims, and altogether 43 persons were killed and about 40 injured. It is said that the disaster was due to the negligence of the station master at Limito, who had been on duty 48 hours.

Shipbuilding Plants in the United States.

The *Marine Review* has sent out a circular to 25 of the principal concerns building steel ships in this country, viz., 14 on the Atlantic coast, 8 on the lakes, 2 on the Pacific coast and 1 on the Mississippi, asking for approximate figures covering the present value of their plants; also, how much of such values is represented in investments made within the past 10 years. The aggregate value returned was $32,865,000, of which $24,996,000 has been expended in additions and improvements within the last 10 years. Mr. W. H. Cramp says: The amount of money we have expended in the development of ship-

building and its cognate or contributory industries cannot be measured by the cost of mere enlargements of our plant. He claims that about $20,000,000, covering the sums paid for labor and material tending to enlarge the organization and augment the general output capacity of the works, is the real measure of their expenditures to promote shipbuilding.

Late Trains in France.

The reader will doubtless remember that some time ago the French Minister of Public Works issued an order providing for the imposition of fines for every railroad train that reached its destination behind time. It appears now that the State railroads, which are worked under the direction of the Minister himself, have been the worst offenders and it is said that there are over 2,000 charges of unpunctuality against them since the beginning of last October.

Lake Notes.

The Buffalo *Courier* prints the following table, which it claims is substantially correct, though not wholly accurate, showing the loss of life and property on the lakes for several years past:

Year.	No. of lives lost.	No. of boats.	Tonnage.	Value.
1886	138	57	17,070	$956,100
1887	204	73	20,687	792,000
1888	16	48	17,760	439,000
1889	20	..	14,086	540,000
1891	57	..	.....	.....
1892	99	..	23,708	1,014,250
1893	123	53	21,258	1,040,400

For this year, in addition to the above total loss, over a million dollars more should be charged to partial losses, bringing the aggregate up to $2,112,588. The aggregate value of cargoes in the lost boats was $371,851, all of which was covered by insurance. Almost half the lives were lost in the shallow waters of Lake Erie. The largest loss of property, in proportion to traffic, was between Lakes Superior and Huron, a conservative estimate placing this tax on Lake Superior traffic at $200,000 for the season.

The lakes are closing with a great amount of flour to come forward; the Northern and Lehigh lines having had 160,000 barrels of flour afloat on the 2d inst. There were also 160,000 barrels of flour at Gladstone and much flour must be left at the head of Lake Superior, the last boats having left there on the 1st inst., which is the probable date of the last sailings from Marquette and Fort William.

It is hoped to continue grain shipments from Chicago to Buffalo, though the rate demanded, 3½ cents for corn with an insurance rate of 1.10 to 1.25 per cent., is nearly equal to the cut rates now being made by all rail routes. Boats, however, are badly iced up, and the crews are frost bitten, with the therometer below zero.

Grain receipts at Buffalo April to November, inclusive, were 2,626,033 bushels this year, as against 2,813,680 bushels in 1892, a decrease of about seven per cent. The ore receipts at Ashtabula this year were 1,855,502 tons, nearly 25 per cent. less than last year. About $7,000,000 was paid last year for lake freights in iron ore. The receipts for this year have been for a smaller amount and at a lower rate; and as there is an almost total suspension of shipbuilding on the lakes, we may believe that the season now brought to a close has been a disastrous one. The owners of the lake fleet have proposed a trust, but that was immediately seen to be impracticable. A minimum rate was then proposed on the basis of $1.05 from the head of Lake Superior to Lake Erie ports on iron ore, and 50 cents from these ports to head of Lake Superior for coal. These rates are about 35 per cent. above the rates of this year and nearly up to the rates of a year ago. The miners, who want something lower even than this year's rates, have approached the railroads asking relief, but with little luck so far.

Dock Extension in New York.

Some time ago the Dock Commissioners considered the proposition to appropriate the North River front facing Riverside Park to the construction of docks for commercial purposes. It was proposed to extend the park to the water line in connection with these plans and thus make a combination of land and water attraction. The point was that that part of the water front could never be generally profitable or beneficial to the public. There are but two points, at seventy-ninth and ninety sixth streets, where vehicles can reach the river without long hauls. It was therefore argued that docks would be of little general value or utility, those already existing being almost wholly for brick and lumber. For the accommodation of the railroads and steamship companies and for the convenience of ocean passengers these objections do not exist. The river is deep in that part of the water front and the New York Central Railroad can build a track to every dock that may be built along the river, and if docks were built there ocean steamers could run to them directly and discharge their freight directly into the cars without rehandling. The Park Board has not approved this plan, but has entered the wedge by deciding to set aside for the use of the Dock Board 1,100 ft. at the foot of Seventy-ninth street and 825 ft. at the foot of Ninty-sixth street. Of the 1,100 ft., 225 ft. will be reserved for a ferry slip, and it is reported that the Pennsylvania Railroad Company will establish a ferry to this point.

LOCOMOTIVE BUILDING.

The order of the Atchison, Topeka and Santa Fe for 91 locomotives, 71 from the Baldwin Locomotive Works and 20 from the Richmond Locomotive Works, was referred to last week. The Baldwin order is for the following engines: ten 20 × 26 cylinder consolidation engines, six 19 × 26-cylinder 10-wheel engines, ten 18 × 24-cylinder 10-wheel engines, 15 17 × 24-cylinder 10-wheel engines, 20 17 × 24-cylinder 8-wheel engines, 10 19 × 24-cylinder mogul engines. Of these 42 are to be built immediately, and the remainder will be constructed during the year 1894. The six 19 in. × 24 in.-cylinder 10-wheel engines are for the Southern California road, the ten 19-in. × 24-in. cylinder moguls are for the St. Louis & San Francisco, and the remainder are for the Santa Fe system proper. The engines to be built by the Richmond Locomotive Works are 10 consolidation and ten 10-wheelers.

CAR BUILDING.

A contract for 250 coal cars, with air-brakes, for the Beech Creek, has been completed at the Buffalo Car Works.

The Basic City (Va.) Car Works has just completed and delivered to the Chesapeake & Ohio 30 improved coal cars and is making arrangements to increase the output of the plant.

Murray, Dougal & Co., Limited, of Milton, Pa., are at present working on an order of 250 cars for the Wilkes-Barre & Hudson River Improvement Co. It will probably be completed this month. The firm also has an order from the Elmira, Cortland & Northern for 100 cars.

Orders have been issued to the Roanoke Machine Works to resume work on the locomotives and passenger cars for the Norfolk & Western, ordered several months ago, on which work was stopped during the summer.

This week the last shipment of a large order for cars from the Burton Stock Car Co. was made from the Middletown plant of Arthur King. Several car loads of narrow gage cars for export to Cuba were also shipped from the same place last Saturday.

BRIDGE BUILDING.

Baltimore, Md.—The viaduct across Stony River for the City & Suburban Railroad is being manufactured by the Pennsylvania Steel Co. It is designed to carry electric street railroad cars and comprises one pin-connected through span 250 ft. long, with approach trestle on either side of 25 plate girder spans 30 ft., two 30 ft. 9 in. and one 23 ft. long; total length 1,085 ft.; estimated weight about 300 tons.

The contract for the Maryland avenue bridge over Jones' Falls has been awarded to R. C. Hoffman & Co., representing the Pennsylvania Steel Co. Their bid was $13,489.

Ben Avon, Pa.—The Spruce Run Bridge Co., of Pittsburgh, has been chartered to construct a bridge across Spruce Run, in the borough of Ben Avon. The directors are: Thomas R. Pittock and Ralph T. Pittock, of Dixmont, and John Crossett and Michael McDavitt, of Glenfield, Pa.

Blackstone, Mass.—The contract for Bridge No. 32, at Blackstone, Mass., on the New York & New England, has been placed with the Phœnix Bridge Company. This is a double track, plate girder bridge about 200 ft. long; estimated weight 160 tons.

Bloomsburg, Pa.—The County Commissioners have let the contract for the new iron and steel river bridge at this point to the King Iron Bridge Co., the lowest of three bidders, with its bid of $35,500. The structure is to be 1,150 ft. long, with an 18-ft. roadway.

Boyd's Station, Pa.—The Dauphin County Commissioners have let the contract for the stone work of a new 70-ft. single span iron bridge over the Philadelphia & Reading tracks at Boyd's station. Bowers & Fishburn, of East Harrisburg, secured the contract at their bid of $2,055. The contract for the superstructure will soon be let.

Charlottetown, P. E. I.—The Secretary of Public Works is calling for tenders for rebuilding Doyle's Bridge.

Grand Mere, Que.—A new iron bridge is to be constructed across the St. Maurice River.

Halifax, N. S.—The General Manager of the Intercolonial Railroad, David Pottinger, of Moncton, N. B., is calling for tenders, to be received up to Dec. 28, for the construction and erection of a steel through bridge of five spans over the Narrows, Halifax harbor, including piers and abutments, containing about 6,000 yds. of ashlar masonry and about 1,000 yds. of concrete. Three of the spans are 260 ft. and two 100 ft. Four of the piers are in tidal water from 65 to 86 ft. in depth. Plans and specifications may be seen at the office of the Station Master, North street station, Halifax, and at the office of P. S. Archibald, Chief Engineer, Moncton, N. B., where forms of tender may be obtained.

New Haven, Conn.—The contract for the Oak street bridge between this city and the town of Orange has been placed with the Berlin Iron Bridge Co. The plans furnished by C. W. Kelly, the City Engineer, call for a steel plate girder structure of one span 79 ft. 6 in. long, and 75 ft. in the clear, with 30 ft. roadway and two sidewalks 7 ft. wide.

New York, Lake Erie & Western.—In addition to the contracts with the Union Bridge Co., already noted in these columns, for bridges No. 6, Delaware Division, and No. 69, Susquehana Division, two heavy double track bridges, this railroad has placed the following contracts with the Elmira Bridge Co.: Bridge No. 25, Western Division, one single track, half through, plate girder span, 99 ft. 6 in. long, estimated weight 92 tons.

For the New York, Pennsylvania & Ohio Division, Bridge No. 24, one single track, through, pin-connected span, 127 ft. long, 17 ft. 6 in. wide, 27 ft. deep, and a deck plate girder open span 34 ft. long.

For the Chicago & Erie Divison, bridges Nos. 201 and 329, each a single track, deck, plate girder span, 17 ft. 6 in. long, estimated weight 7 tons; bridge No. 89, a single track, deck, plate girder span, 77 ft. 6 in. long, estimated weight 90 tons; and bridges Nos. 223, 226, 235 and 374, each a single track deck plate girder span, 25 ft. 6 in. long, estimated weight 25 tons.

New York, New Haven & Hartford.—Contracts for six plate girder bridges, aggregating 250 tons, were recently placed with the Berlin Iron Bridge Co., and for two plate girder spans weighing 21 tons with the R. F. Hawkins Iron Works, of Springfield, Mass.

A three-span, double track, plate girder bridge 125 ft. long has recently been shipped for the Stonington Division by the Edge Moor Bridge Works.

Ottawa, Ont.—An interprovincial bridge will be built over the River Chaudiere between Hull, Que., and this city. The cost will be over $50,000.

Richmond, Va.—The Richmond & Danville Railroad is about to replace the present James River Bridge at this place by a new steel structure of five pin-connected through spans, each 125 ft. long.

Washington, D. C.—A movement is in progress to secure the establishment of a bridge over James Creek at P street south, Washington, D. C. There are new bridges on M and N streets southwest, but none on P street.

Winnipeg, Man.—Plans for new bridgework have been discussed for some time by the city government, and Major Puttan, City Engineer, has just submitted estimates of the cost of a new bridge at Armstrong's Point, on the Assinniboine River and at Main street, and for rebuilding the Osborne street bridge. The total estimated cost is $115,000, which would provide for new bridges at Armstrong's Point and Main street, and the rebuilding of the present Osborn street bridge, using the iron superstructure of the old Main street bridge.

Youngsville, Pa.—The Dunkirk, Allegheny Valley & Pittsburgh is replacing the wooden trestle over the Philadelphia & Erie tracks at Youngsville with an iron bridge, which will be 400 ft. long.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Albany & Susquehanna, semi-annual, 3½ per cent., payable Jan. 2.

Boston & Lowell, semi-annual, 3½ per cent., payable Jan. 1.

Boston & Albany, quarterly, $2 per share, payable Dec. 30.

Chicago & Eastern Illinois, quarterly, 1¾ per cent. on the preferred stock, payable Jan. 2.

Cleveland, Cincinnati, Chicago & St. Louis, quarterly, 1¼ per cent. on the preferred stock, payable Jan. 2.

Columbus, Hocking Valley & Toledo, 2½ per cent., on the preferred stock, payable Jan. 2.

Delaware & Hudson Canal, quarterly, 1¾ per cent., payable Dec. 15.

Maine Central, quarterly, 1¼ per cent., payable Jan. 1.

Philadelphia, Wilmington & Baltimore, semi-annual, 4 per cent., payable Jan. 2.

Rensselaer & Saratoga, semi-annual, 4 per cent., payable Jan. 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlantic & Pacific, annual, New York City, Dec. 14.

Brooklyn Elevated, annual, Brooklyn, N. Y., Jan. 3.

Cleveland & Pittsburgh, annual, Cleveland, O., Jan. 3.

Columbus, Shawnee & Hocking, special, Columbus, O., Dec. 20. To consider the proposed consolidation with the Sandusky & Columbus Short Line.

Grand River Valley, special, Jackson, Mich., Jan. 10.

New York & New England, special, Boston, Mass., Dec. 27.

New York & Northern, adjourned, New York City, Dec. 12.

Rome, Watertown & Ogdensburg, annual, New York City, Dec. 28.

Sandusky & Columbus Short Line, special, Sandusky, O., Dec. 21. To consider the proposed consolidation with the Columbus, Shawnee & Hocking.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Traveling Passenger Agents' Association* will hold its convention in New Orleans, La., Jan. 9.

The *Northwestern Track and Bridge Association* will meet at the St. Paul Union Station, on Dec. 13, at 2:30 p. m.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo, on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Engineers' Club of Cincinnati.

At the October meeting of the Club there was an attendance of 26 members. Mr. Charles A. Ewing read a paper on "Contractors versus Specifications," which he discussed from the standpoint that contractors do not receive just recognition from the engineering profession,

but are a mistreated class, and made so by the forms of specifications and contracts imposed upon them. He suggested that a modification of these would prove of benefit to both the engineer and the contractor. A lively discussion followed the reading of the paper.

Central Railway Club.

The next regular meeting of the Club, which is the annual meeting, will be held at the Hotel Iroquois, Buffalo, N. Y., Jan. 24, when officers will be elected. The annual dinner will be a not unimportant feature of the meeting. The subject for discussion will be: "Leaky Tubes on Locomotives, Their Causes and How to Prevent Them."

Engineeaing Association of the South.

The next regular meeting of the Engineering Association of the South will be held at the headquarters in Nashville, Tenn., on Dec. 14. Hunter McDonald is now Secretary of the Association.

PERSONAL.

—Mr. J. E. Hennegan, General Passenger Agent of the Burlington, Cedar Rapids & Northern, has resigned.

—Mr. J. M. Ashley, President of the Toledo, Ann Arbor & North Michigan road, is now lying dangerously ill at his home in Toledo.

—Mr. George Warfel, Western Passenger Agent of the Baltimore & Ohio Southwestern, has been transferred to Cincinnati as Assistant General Passenger Agent.

—Mr. J. N. Weaver, Master Mechanic of the Lehigh Valley at the Sayre shops, has been made Assistant General Superintendent of the Northern Division, with headquarters at Sayre, Pa.

—Receivers Clark, Mink, Anderson, Doane and Coudert, of the Union Pacific, have petitioned the United States District Court at Omaha for an order fixing their salaries at $1,500 each per month.

—Mr. W. A. Garrett has been appointed Superintendent of Terminals of the Wabash for St. Louis and East St. Louis. He was, until recently, Superintendent of the Terminal Railroad Association of St. Louis.

—Mr. W. G. Van Buskirk, Master Mechanic of the Peoria Division of the Terre Haute & Indianapolis (Vandalia), died suddenly last week while on a train of the company, and in conversation with a superior officer.

—Mr. A. K. McGown, Trainmaster of the Knoxville, Cumberland Gap & Louisville road, has been appointed Superintendent of the Middlesborough Belt road, which is now operated by the Receiver in connection with the former line.

—Mr George W. Barnhart, General Agent of the St. Louis Southwestern, at Ft. Worth, Tex., has been appointed General Freight Agent of the lines in Texas, with headquarters at Tyler, Tex. He succeeds Mr. C J. Pickering, deceased.

—Mr. I. B. Futvoye, Superintendent of the Northern division of the Central of Vermont, has, it is reported, been asked to accept the general management of the Baie des Chaleurs Railroad in Quebec, and he has the matter now under consideration.

—Mr. John D. Campbell, who resigned last week from the position of Assistant Superintendent of Motive Power of the New York Central & Hudson River in charge of the car shops at Depew, received handsome presents of silverware from his old subordinates.

—Mr. Willis Ranney, formerly Secretary of the Louisville & Nashville, died at Louisville, Ky., Dec. 3, aged 88 years. He was born in Massachusetts in 1805, and entered the employ of the Louisville & Nashville in 1855 as Secretary, remaining in the service of the company until 1885, when he was retired on a pension.

—Mr. John W. Royer, Superintendent of the Philadelphia & Reading Relief Association, died in Philadelphia on Dec. 1. Mr. Royer was 52 years old, and had spent 30 years in the service of the Philadelphia & Reading Company, which he entered in boyhood. He became Superintendent of the Relief Department when it was organized in 1888.

—Mr. Edward Martin died at his home in Red Hook, N. Y on Dec. 3, aged 83. He was a civil engineer and had surveyed many railroads in this country. He located the Hudson River Railroad from Albany as far as Hyde Park. When this work was completed he was made General Superintendent of the Galena & Chicago road. When the Rhinebeck & Connecticut Railroad was built, nearly 20 years ago, he was made its President, and was a large shareholder.

—Mr. J. J. Casey, for several years Superintendent of Motive Power of the Yazoo & Mississippi Valley road, with headquarters at Vicksburg, has been made Assistant Superintendent of Motive Power of the Illinois Central system, with headquarters at Chicago. The Yazoo & Mississippi Valley will pass under supervision of the general officers of the Illinois Central system. Mr. Charles Linstrum will become Master Mechanic in charge of the Vicksburg shops, which are the largest on the Illinois Central system south of the Ohio. They were constructed under the supervision of Mr. Casey several years ago.

—Mr. C. J. Pickering, General Freight Agent of the St. Louis Southwestern system, in Texas, died at his home in Tyler, Tex., on Nov. 26. Mr. Pickering's first experience in freight matters was with the St. Louis Transfer Co., in St. Louis. Then he went into the freight-claim office of the Missouri Pacific, and subsequently was made Chief Clerk of the general freight office of the Missouri, Kansas & Texas, at Sedalia, Mo. A year later he was appointed Commercial Agent at Houston, Tex., which he resigned to accept similar service with the St. Louis, Arkansas & Texas at the same point. In 1892 he became Division Freight Agent of the "Cotton Belt," at Little Rock, Ark., where he continued until June 1 of this year, when he was promoted to General Freight Agent of the lines in Texas.

—Mr. Geo. S. Payson, General Counsel for the Western Railroad Association, died at his home in Chicago, on Dec. 1, of nervous prostration. Mr. Payson was born in Portland, Me., in 1824 and was educated in the schools of that city and at Bowdoin College, from which latter institution he was graduated in 1843. He went shortly afterward to New York, where he spent several years in the study and practice of law. In 1856 he went to Chicago and began the practice of his profession, and after 1874 confined himself almost exclusively to patent law. He became shortly afterward General Counsel for the Western Railroad Association, which position he held up to the time of his death. Mr. Payson had been ill since last June and unable to attend to business. In September he went to California in hopes of benefiting his health, but stayed only a short time. He has long enjoyed a high reputation as one of the leading lawyers of Chicago and leaves many friends to testify to his ability and fine social qualities.

—John Tyndall died at his home in Haslemere, England, Dec. 4, at the age of 73. All the world knows who he was, and the daily newspapers of all civilized lands will tell of his life and career in great detail. Therefore we shall not attempt any extended sketch of his life or any estimate of his character and his work. As a student and investigator he has taken rank among the great men; as a writer and speaker on scientific matters he has taken rank among the greatest, and some of our readers know the charm of the man in private life—his fire, his glowing enthusiasm and his geniality.

John Tyndall was born in Ireland in 1820, at Leighton Bridge, near Carlow. His parents were poor, and could give him but little opportunity for education. However, he acquired considerable mathematics, and good English literature developed his taste and imagination. It is interesting to many of us to know that Carlyle impressed him profoundly. Tyndall contrived to make a civil engineer of himself, and from 1844 to 1847 he worked at railroad surveys and construction. Then followed a year of school teaching, and then began the special studies which made him famous. He was a student under Bunsen in 1848, and in 1851 he went to Berlin, where he was associated with such men as Magnus, Clausius, Wiedeman and Humboldt. In 1852 he was elected a Fellow of the Royal Society, and in the following year professor of natural philosophy at the Royal Institution to succeed Faraday. Three years later he visited the Swiss glaciers with Professor Huxley. Professor Tyndall visited this country in 1872 on a lecturing tour. The proceeds of the trip, amounting to $23,000, he placed in the hands of a committee for the benefit of students engaged in original research.

—Col. Joseph D. Potts, for many years identified with transportation interests in this country, died at Milton, Pa., on Dec. 3, in his 64th year. Colonel Potts had remarkable executive ability, and was regarded by his associates as a man of clearest judgment and foresight. In the management of the International Navigation Co., the Philadelphia & Erie Railroad and the Empire Steamship Line, he was particularly interested. He was born in 1829, and came of the famous Potts family of Pennsylvania, so widely known through their connection with the development of the Schuylkill iron region. Instead of following the occupation of his ancestors, he became a civil engineer, and was connected with various railroads, first with the Sunbury & Erie in 1852. Subsequently he was made Vice-President of the Steubenville & Indiana road, Superintendent of the Western Division of the Pennsylvania Railroad and President of the Western Transportation Co. Upon the breaking out of the Civil War Governor Curtin, of Pennsylvania, appointed him Chief of the Transportation and Telegraph Department of the State. In 1862 he was detailed by General Reynolds as Military Superintendent of the Franklin Railroad, and performed prompt and valuable service in that capacity. The next few years constituted the most active and responsible period of a busy career. From 1862 to 1865 Colonel Potts servep as General Manager of the Philadelphia & Erie Railroad for its lessee, the Pennsylvania Railroad. From 1865 to 1877 he was President of the Empire Transportation Co., and in 1871 was elected President of the Erie & Western Transportation Company, the latter still operating a fleet of propellers upon the Great Lakes. In 1874 he became a Managing Director in the National Storage Co., and in 1879 President of the National Docks Railway Co., both New Jersey corporations. He held these positions until 1884, when he resigned them both. He was elected President of the Enterprise Transit Company in 1871, which position he held until his death. For some years prior to 1885 he was President of the Girard Point Storage Co. (which is the owner of the extensive elevators, wharves, warehouses, railroads, etc., near the mouth of the Schuylkill River), and had ever since been a director of the company. He was, from its establishment, a large owner and a director in the International Navigation Company, which operates the Red Star Line, the Inman and International Line and American Line of ocean steamers. Of late years Colonel Potts had withdrawn as far as possible from active positions, but he assumed other business interests and became part owner of the Potts Brothers' Iron Co., Limited, of Pottstown, which owns and operates a rolling mill in that place. In 1890 he purchased the Chester Pipe & Tube Works, at Chester. In 1880 he bought the Isabella Furnace, in Chester County, formerly owned by his father.

ELECTIONS AND APPOINTMENTS.

Alabama Midland.—The annual meeting of the stockholders held in Montgomery, Ala., on Dec. 1, resulted in the election of the following directors: H. B. Plant, M. F. Plant, Henry Sanford, H. S. Haines, M. J. O'Brien, H. M. Flagler, R. G. Erwin, O. C. Wyly, W. F. Vandiver, Major Carroll, William K. Pelser.

Baltimore & Ohio Southwestern.—General Superintendent I. G. Rawn announces the following appointments: J. G. Neuffer to be Master Mechanic, with headquarters at Cincinnati, O.; T. G. Duncan, to be Assistant Master Mechanic Ohio Division with headquarters at Chillicothe O.; C, Skinner, Assistant Master Mechanic Mississipi Division, headquarters at Washington, Ind.

Charleston & Savannah —At the stockholders' meeting held at Charleston, S. C., on Nov. 25, the following officers were elected: President, H. B. Plant; Vice-President, H. S. Haines; Secretary, R. B. Smith; Treasurer, T. M. Lee, and Superintendent, C. S. Gadsden. Directors: H. B. Plant, B. F. Newcomer, W. B. Walters, H. S. Haines, A. F. Ravenel, W. H. Brawley, and E. R. Meminger.

Chesapeake & Ohio.—The annual meeting of the stockholders was held at Richmond, Va., on Nov. 28, and the following directors were elected: M. E. Ingalls, W. P. Anderson, Cincinnati; Chauncey M. Depew, C H. Coster, George T. Bliss, Charles D. Dickey, Jr., Samuel Spencer, New York, and Decatur Axtell and Henry T. Wickham, of Richmond. The election of Mr. Depew to succeed C. P. Huntington is the only change in the list of directors.

Cleveland, Akron & Columbus —P. G. Joyce has been appointed General Agent (Freight Department) of this company, with headquarters at Cleveland, O.

W. J. Vance, formerly General Foreman, has been appointed Master Mechanic of this road, with headquarters at Mount Vernon, O.

Detroit, Bay City & Alpena.—T. G. Winnett has been appointed General Freight and Passenger Agent of this road with headquarters at East Tawas, Mich.

Illinois Central.—J. J. Casey, formerly master mechanic at Vicksburg, has been appointed Assistant Superintendent of Machinery, with headquarters at Chicago. Charles Linstrum has been appointed Master Mechanic of the Yazoo & Mississippi Valley, with headquarters at Vicksburg, Miss.

Kansas City, Watkins & Gulf.—John F. McCoy having resigned to accept other service the office of Traffic Manager has been abolished and the duties of the said office will be assumed by F. S. Hammond, General Manager, Lake Charles, La.

Kearney & Black Hills.—The local headquarters of this company which heretofore have been at Kearney, Neb., have been removed to Omaha, and hereafter J. H. Lothrop, Assistant Superintendent, will be the only officer located at Kearney. The road is operated by the Union Pacific.

Lake Shore & Michigan Southern.—G. N. Dow, Division Master Car Builder at Cleveland, is in temporary charge of the new car repair shops of the company just established in the plant of the Erie car works at Erie.

Lancaster & Reading Narrow Gage.—Michael Reilly is acting as Superintendent of this road for the trustees who have been operating the line since the lease to the Philadelphia & Reading was abandoned.

La Porte, Houston & Northern.—Charles W. Nelson, formerly of Auburn, N. Y., has been appointed Superintendent of this road, with headquarters at Houston, Tex.

Middlesborough Belt.—A. K. McCown has been appointed Superintendent of the above company, with headquarters at Middlesborough, Ky.

New York, Lake Erie & Western.—E. C. Ensign has been appointed Acting General Baggage Agent, with headquarters at Chambers Street Ferry, New York City, vice Charles H. Clough, transferred to other duties connected with the General Passenger Department.

The directors have re-elected the former officers, as follows: President, John King; Vice-Presidents, E. B. Thomas, George H. Vaillant, Andrew Donaldson; Secretary, A. R. MacDonough; Treasurer, Edward White. The following were named by the directors to prepare a plan of reorganization: J. G. McCullough, Morris K. Jesup, Alexander E. Orr, Abram S. Hewitt, J. Lowber Welsh, W. A. Wheelock and John King, the President ex-officio.

New York & New England.—In addition to his duties as Superintendent of the Eastern and Norwich & Worcester divisions, F. E. Dewey has been appointed Superintendent of Transportion of the road.

Savannah, Florida & Western.—The annual meeting of stockholders was held at Savannah, Ga., on Nov. 28, and the following officers were elected: Directors, H. B. Plant, R. C. Erwin, H. S. Haines, M. K. Jesup, B. F. Newcomer, H. M. Flagler and J. H. Estill; H. B. Plant, President; H. S. Haines, Vice-President; R. G. Erwin, Vice-President and General Counsel; R. B. Smith, Secretary; J. Moultrie Lee, Treasurer; R. G. Fleming, Superintendent.

Ulster & Delaware.—At the annual meeting of the stockholders held on Dec. 5 the following were elected directors: Horsce G. Young, Robert C. Pruyn, Joel W. Burdick, A. Van Santvoord, C. C. Clarke, J. D. Layng, William A. Read, H. C. Soap, Jacob H. Tremper, A. S. Staples, Samuel G. Dimmick, Davis Winnie and Charles Bray.

Union Pacific.—Notice has been given of the appointment of W. T. Holly to the office of General Agent Passenger Department, of the system, with headquarters in Chicago. He is at present City Passenger and Ticket Agent of the Union Pacific in Chicago.

The office of Oliver W. Mink, one of the Receivers, is to be transferred from Boston to New York, where the Receivers have opened offices at 36 Wall street. Mr. Mink is also Vice-President and Comptroller of the company as well as Receiver.

West Shore.—E. L. Somers has been appointed General Western Freight Agent, with headquarters at No. 236 South Clark street, Chicago.

RAILROAD CONSTRUCTION.
Incorporations, Surveys, Etc.

Abbeville Southern.—The first train over the entire road reached Abbeville, Ala., on Nov. 27. The road is 27 miles long, beginning at Abbeville Junction on the Alabama Midland and extending northwest to Abbeville. It will be operated by the Alabama Midland.

Altoona & Philipsburg, Connecting.—E. A. Tennis, of Thompsontown, Pa., who has the contract for the grading and tracklaying of this new line from Altoona to a connection with the Beech Creek at Philipsburg, Pa., has completed the nine miles between Philipsburg and Houtzdale, and is now grading toward Altoona, a distance of 20 miles. Samuel P. Langdon of Philadelphia is President of this road.

Astoria & Eastern.—J. C. Stanton and J. S. Smith, of New York City, who have been interested for some time in the project for building a road east of Astoria, Or., have visited Astoria recently and seem to be still engaged in an attempt to form a company to take up the project. They ask a subsidy of 3,000 acres of land, free right of way and terminals in the city of Astoria, and the citizens are now attempting to meet this requirement. It is said that Smith and Stanton have formed a construction company with a subscribed capital of $650,000 and that they will secure from the Columbia River & Astoria Railroad the charts and profiles made by that company in 1892. If the company is organized it will undertake to complete the Seaside road into Astoria and build a new line to Goble, Or., 82 miles, altogether. W. H. Kennedy, of Portland, will be the Chief Engineer.

Baltimore & Cumberland.—Chief Engineer Chauncey Ives, has discovered a route, a survey of which, it is thought, will show a more practicable line than those surveyed for the road to enter Hancock, Md., from the west. The route will be a mile shorter, without heavy cuts, and will afford a descending grade into Hancock. This route would also be more beneficial to the town of Hancock.

The surveying party under Engineer Murdoch, which has been working on the surveys on the eastern part of

the line between Cumberland and Hancock, Md., for the past few weeks, has been ordered to suspend all work by Chief Engineer Chauncey Ives. The party has been disbanded and it is thought that no further surveying or work will be done until the contracts are let, which, it is thought; will be done in the spring.

Bangor & Portland.—The road from Nazareth to Allentown, Pa., a distance of 12 miles, will be surveyed during December by Birge Pearson, of Easton, Pa., Chief Engineer. It will be an extension of this road, now in running order from Portland, Pa., along the Delaware River to Nazareth. When the Allentown branch is completed it will connect the Delaware and Lehigh rivers by rail, and will be a valuable feeder to the Delaware, Lackawanna & Western and Pennsylvania railroads. The project is in the hands of John I. Blair, of Blairstown, N. J.; C. Miller, now President of the above road, of the same place, and Clinton De Witt Blair, of Belvidere. The cost will be about $200,000. It is said the Blair banking-house, of New York, is also interested.

Belington & Little Laurel.—The company was incorporated in West Virginia last week with a capital stock of $200,000. The company proposes to build a line from Belington to the headwaters of Little Laurel Creek, in Randolph County. The principal office is to be at Harding. The incorporators are Frank E. Reese, of Belington, W. Va.; Solomon Sturmer and F. Wiscayer, of Pittsburgh; Charles Bradbury and J. C. Wilson, of Harding, W. Va.

Burlington & Missouri River.—The branch through the Black Hills to Spearfish, S. D., was opened on Dec. 2. This extension leaves the present Deadwood line at Englewood, S. D., and reaches Spearfish by a line 31 miles long, although the direct distance between the two towns is not much more than 20 miles.

Ebensburg & Black Lick.—Work is to be resumed in a few days and the line pushed to completion as rapidly as possible. The road is a branch of the Pennsylvania, being built from Ebensburg, Pa., west through Indiana county to Black Lick, to develop coal lands About 10 milesof the grading was done last summer, but no track has yet been built.

Glendon & Gulf.—Work has been resumed on this North Carolina line and the construction force is now erecting a bridge across Deep River near Glendon.

Gulf, Beaumont & Kansas City.—The road is now being operated for 20 miles north of Beaumont, Tex., the principal traffic so far being in hauling logs. There is good farming land along the line, which will also afford considerable freight. The present terminus of the completed line is at Valley Creek, in Jasper County. The preliminary surveys to the quarries in the northern end of the county are being made by Engineer Kopke, and probably the locating line will be run as soon as the present surveys have been made. President Kirby is now in Boston, and expects to complete the financial arrangements for extending the line through Jasper County.

Holston Valley.—The construction work on this road has been continued steadily through the summer, and the grading is now practically finished for much of the distance from Bristol, Tenn., to the timber lands to which the road is being built. About half the line from Bristol is ready for the tracklaying, but no arrangements have yet been made for beginning this work. The principal bridge is across the Holston River, and it is now about completed.

Intercolonial.—McKenzie & McCarthy, engineers, are making a preliminary survey for a branch road from George's River to the Sydney coal mines in Cape Breton, thence to connect with the line at North Sydney, which is now the terminus of the road on Cape Breton Island.

Lake Superior, Southwestern & Gulf.—A charter for this road has been recently filed in Iowa. The objects of the company are not stated in the charter and one is apparently left to guess the route from the comprehensive title. The plans of the company have been made the subject of column articles in several of the Western papers, but the statements are so delightfully indefinite that the reader is left with a very uncertain idea of what the company proposes to do. It would appear, however, that the first inception of the project was to build about 200 miles south of Aurora, Mo., toward Little Rock, but "broader minds" took up the project and now propose to unite unnamed roads in Minnesota with others in Iowa and states farther south until the line gets to New Orleans and Sabine Pass. E. R. Bristol, of St. Paul, is given as the President of the company; L. M. Martin, of Des Moines, Ia., General Manager of the Des Moines, Northern & Western, is General Manager; J. M. Miller, of Springfield, Mo., is Secretary, and L. S. Steadman is Chief Engineer.

Mexican Central.—A short branch about 30 miles in length is to be built from Cazadero, Mex., a point on this line, southwest, for the purpose of obtaining wood from the Jazmin Mountains. It will be built by private parties, and this company is to have no ownership in it, though it may operate the line when completed. This item was printed last week by mistake under the title of the Kings River road.

Monongahela River & Broughton.—A charter was granted at Harrisburg, Pa., this week to the above company to build a road from Hayes' Station, Allegheny County, to Option, Allegheny County. The officers are John A. Schully, Charles Donnelly and Frank Armstrong, of Pittsburgh.

National of Tehuantepec.—The Mexican Government has let a contract for joining the rails across the isthmus to Hon. Chandos S. Stanhope, of the City of Mexico. This contract is in the interest of the bondholders, represented by the Dresdener Bank of Berlin, which placed £2,700,000 issue of government bonds of the series of the National Railroad of Tehuantepec. The contract, however, with Mr. Stanhope does not embrace anything but the completion of the railroad; that is, the harbor works and the operation of the line are not included.

New Roads.—A meeting of those interested in the building of a line from Elkton to Lambson's, in Kent County, Md., was held at Elkton, Dec. 5.

New York & Atlantic City Terminal.—A certificate of organization of the above company was filed last week in New Jersey. The capital stock is placed at $150,000 and the incorporators are Dr. Gustave P. Gehring, Charles Collins, Richard W. Cornwall, Charles L. Work and Joseph Peterson. The route of the road is not given in the organization papers nor are the objects for which the company was formed.

Ottawa, Arnprior & Parry Sound.—A new survey has been made by the engineers of this road between Renfrew and Barry's Bay, Ont., 50 miles, which, it is said, gives a much better location than the first survey, and reduces the grades materially.

Pittsburgh & Lake Erie.—The Washington Run branch has been completed and opened for traffic. The new branch runs from Whitsett, Pa., on the Youghiogheny River, up Washington Run to Perryopolis, a distance of about eight miles. The section traversed is a rich, undeveloped portion of the Connellsville Coke region. The branch is the same as the branch of the Pittsburgh, McKeesport & Youghiogheny road.

St. Joseph, Tarkio & Northwestern.—The company has been recently reorganized, and it is stated that there is some chance of part of the road to Tarkio, Mo., being built next year. The new Board of Directors are David Rankin, W. F. Rankin and J. H. Prather, of Tarkio, Mo.; C. B. Berry, of St. Joseph; Colonel Scheuster, of Savannah, Mo., and H. C. Keller, of Leavenworth.

Washington & Chesapeake Bay.—The contract for this road was let to a New York firm just one year ago, but no work has been done on the line. It is now stated that right of way agents are again negotiating for property along the line in the neighborhood of Bristol, Md., and that there is a good prospect that this work will be closed up shortly. The line projected is about 27 miles long from a point near Washington, D. C., southeast to a point on Chesapeake Bay, where the company has acquired a large tract of land, which it is proposed to improve.

GENERAL RAILROAD NEWS.

Altoona, Clearfield & Northern.—Samuel P. Langdon and F. G. Patterson, of Altoona, were appointed Receivers for this road by the Blair County Court in Pennsylvania last week, the Receivers representing the opposing parties of stockholders. The appointment of a receiver was asked for last week by S. P. Langdon, who was recently President of the road, the application being another phase of the extensive litigation in which the road has been involved for the last year. The road is only 15 miles long, extending from Altoona to Dougherty, 15 miles, but it is said that the Pennsylvania and Beech Creek roads are both anxious to secure control of it. Mr. Langdon is building the Altoona & Phillipsburg Connecting road from Altoona to connect with the Beech Creek at Phillipsburgh. In 1892 he bought considerable stock of the Altoona, Clearfield & Northern, enough, it was believed, to secure control. At the annual meeting in February last Mr. Patterson and his friends attempted to vote on 600 shares of stock which, it was claimed by Mr. Langdon, had been illegally issued. The meeting split up and two boards of directors were elected, who have since been contending for possession of the road. The Blair County Court sustained the Langdon interest early in the year and ordered the property turned over to that board, but a few weeks ago this decision was reversed by the Pennsylvania Supreme Court and the property restored to Mr. Pattecson and his associates. The Blair County Court now appoint Receivers representing both interests, and has appointed a special master to investigate and report upon the whole subject.

Atchison, Topeka & Santa Fe.—The financial statement for October shows that the losses in gross earnings reported in the monthly statements since July still continue, although by decreasing expenses the net earnings show a gain. The decrease in gross earnings in October was $239,337 on earnings of $3,705,090 in 1893, but this loss was more than made up by decreasing the expenses over $390,000, so that the net earnings for 1893, which were $1,460,372, showed an increase of $150,885 over the figures of 1892. For the four months of the company's fiscal year the gross earnings were $12,985,949, and the net earnings $4,650,815, showing a decrease as compared with the same period in 1892 of $1,703,407 in gross, and $336,097 in net. The surplus for the four months, after deducting fixed charges, was $1,112,815, a decrease of $498,097. These figures are for the Atchison proper. The results for the system, including the St. Louis & San Francisco, are given in the following table:

AGGREGATED GENERAL SYSTEM.

Month of October:	1893.	1892.	Inc. or Dec.
Average oper. mileage....	9,344	9,344	
Gross earn....	$4,512,359	$4,845,998	D. $333,639
Oper. expenses....	2,723,613	3,156,889	D. 433,276
Net earn....	1,788,746	1,689,109	I. 99,637
Other receipts....	40,000	75,000	D. 35,000
Total net earn....	1,828,746	1,764,109	I. 64,637
One-twelfth fixed charges (est.)....	1,227,000	1,194,000	I. 33,000
Surplus....	$601,746	$570,109	I. $31,637
Four months to Oct. 31:			
Average oper. mileage...	9,344	9,344	
Gross earn....	$15,876,808	$18,195,868	D. $2,319,060
Oper. expenses....	10,127,249	11,704,951	D. 1,577,702
Net earn....	5,749,559	6,490,916	D. 741,358
Other receipts....	230,000	300,000	D. 70,000
Total net earn....	5,979,559	6,790,916	D. 811,357
Four-twelfths fixed charges (est.)	4,908,000	4,776,000	I. 132,000
Surplus....	$1,071,559	$2,014,916	D. $913,357

Baltimore & Eastern Shore.—The company has completed extensive improvements at Claiborne, Md., its terminal on Chesapeake Bay. The channel approach to the wharf has been widened and deepened by several feet. On the north side of the pier a long breakwater has been constructed and the railroad pier has been lowered. The improvements have cost about $10,000.

Boston & Maine.—The principal action of the stockholders at a special meeting at Lawrence, Mass., on Nov. 29, seems to have been to increase the rate of interest on the new bonds from four to five per cent. At a stockholders' meeting on Dec. 14, 1892, the directors were authorized to issue $2,000,000 of bonds, and since that time a further issue of $4,000,000 of bonds has been authorized, and both issues will bear the higher rate of interest.

Carolina, Cumberland Gap & Chicago.—An order was granted on Dec. 1 by Judge Aldrich, of the South Carolina Circuit Court, at the instance of Neil McDonald, of New York, one of the principal creditors of the insolvent corporation, placing the property in the hands of a receiver. W. J. Herbert was appointed Receiver. The road is a short line from Aiken to Edgefield, S. C., 24 miles, and has of late been operated by the South Carolina Railroad.

Charleston & Savannah.—The annual report read at the stockholders' meeting shows $630,507 gross earnings, operating expenses, $470,027, and net earnings, $160,479. After paying taxes, dividends and interest, a balance of $37,142 was carried to the credit account of net surplus.

Charlotte, Columbia & Augusta.—Separate Receivers have been appointed under decrees of the United States Circuit Court in South and North Carolina and in Virginia. The decrees were made in suits brought by the Central Trust Company against this railroad and the Richmond & Danville. The Receivers of the latter road, Samuel Spencer, F. W. Huidkoper and Reuben Foster, have transferred to themselves as Receivers of the above road all of its property excepting its leaseholding interest, taking possession as independent Receivers on Nov. 30. The road up to that date had been operated as the South Carolina Division of the Richmond & Danville and apparently the general officers of that company will continue to have jurisdiction over the road. The two branch roads, the Cheraw & Chester and the Chester & Lenore will be operated directly by President A. B. Andrews with L. T. Nichols as Superintendent at Chester, S. C. The leases under which these narrow gage roads have been heretofore operated have been abandoned.

Chicago, Burlington & Quincy.—The statement of earnings for October shows an increase in net earnings despite continued losses in gross earnings. The increase in passenger earnings is noteworthy, especially when such a large decrease in returns from freight traffic is reported.

	1893.	1892.	Inc. or dec.
Freight earn....	$2,224,865	$2,812,987	D. $588,122
Pass. earn....	1,268,796	887,790	I. 381,006
Mail, etc....	350,084	337,675	I. 12,409
Gross earn....	$3,843,746	$4,038,453	D. $194,706
Oper. expen....	2,029,258	2,339,159	D. 309,901
Net earn....	$1,814,448	$1,699,294	I. $115,194
Fixed charges....	830,000	815,075	I. 14,925
Surplus....	$984,487	$884,219	I. $100,269

The gross earnings for the four months were $52,365,718, a decrease of $979,505. The loss from freight traffic for this period was $2,252,342, the passenger earnings increasing $1,311,384. The net earnings for the four months, less operating expenss, were $11,256,703, a decrease of $296,817 as compared with 1892.

Chicago, Milwaukee & St. Paul.—The report made for the month of October and for the four months ending Oct. 31 shows a material reduction in operating expenses in both periods and that large gains were made in both gross and net earnings during the last month:

For October:	1893.	1892.	Inc. or dec.
Gross earnings....	$3,922,657	$3,717,620	I. $205,037
Total expenses....	2,031,314	2,223,825	D. 192,510
Net earnings....	$1,891,343	[$1,493,795	I. $397,547
Four months ending Oct. 31:			
Gross earnings....	$11,947,405	$12,741,842	D. $794,437
Operating expenses....	7,512,697	8,302,530	D. 789,833
Net earnings....	$4,434,708	$4,439,312	D. $4,604

Chicago, Peoria & St. Louis.—C. H. Bosworth and E. Ellery Anderson, Receivers of the road, have filed a petition in the United States Circuit Court in Springfield, Ill., asking that William S. Hook, President of the old Jacksonville Southeastern line, be compelled to make an accounting of all the property of the Chicago, St. Louis & Peoria Railroad in his possession, and that he be restrained from disposing of any such property.

Judges Allen and Wood in the United States Circuit Court at Chicago are hearing the arguments in a suit to foreclose mortgages amounting to nearly $3,000,000, held by the Mercantile Trust Co., the Central Trust Co. and others. One of the parties to the suit is the Jacksonville, Louisville & St. Louis road, whose line is a part of the Chicago, Peoria & St. Louis system. This line asks the court to be released from the receivership and be allowed to operate its own line.

Cincinnati, Lebanon & Northern.—Negotiations for the purchase of this road by the Cincinnati, Jackson & Mackinaw seem to have met with unexpected and unexplained postponement. The present status of the sale does not seem clear. One of the officers of the above company is quoted as saying that all negotiations for the transfer of the property have been abandoned. General Manager Drake, of the Cincinnati, Jackson & Mackinaw, is reported to the effect that a misunderstanding has arisen which is not very serious and will soon be adjusted.

Cleveland, Akron & Columbus.—W. O. Henderson, for the Dutch syndicate of Holland, which controls 19,933 shares of stock in this road, has enjoined the issue of $4,000,000 of bonds authorized at a recent meeting of the stockholders. The proposition to issue these new bonds was carried by a majority of only 25 shares, and the Dutch syndicate claims that under the Ohio laws no company can issue bonds to exceed two-thirds of its capital stock, while in this instance the proposed issue is equal to the entire amount of the capital stock. It is also claimed that the proceedings of the meeting were irregular. The proposed issue was stated to be for the purpose of refunding $1,800,000 of first mortgage bonds, $730,000 second mortgage bonds, to improve the road and for new equipment.

Cleveland & Marietta.—The purchase of this road by the Pennsylvania, which was reported in October, is now confirmed by the Pennsylvania officers. It is announced that the company has purchased two-thirds of the capital stock of the Cleveland & Marietta together with a large tract of coal land contiguous to the road, located in what is known as the Cambridge bituminous coal field of Ohio.

Dover & Statesboro.—The foreclosure sale of this road to F. D. Lockhart, of Augusta, for $36,000, has just been confirmed by the United States Court at Atlanta, Ga., and the property ordered turned over to the purchaser.

Duluth & Winnipeg.—The officers of the Duluth, South Shore & Atlantic will probably assume the control of this road by Jan. 1. The annual meeting of the company is held on Dec. 14 and the terms of the transfer will probably be arranged at that time. W. F. Fitch, General Manager of the Duluth, South Shore & Atlantic, is now President of the company and Samuel Thomas, of New York, is President of the North Star Construction Company which owns most of the stock. The interest of W. H. Fisher, who has been manager of the company since its organization, will be purchased and on his retirement the road will be operated as part of the Duluth, South Shore & Atlantic.

Fitchburg.—Announcement is made of the sale of $1,000,000 of five per cent. bonds. The purchasers are Messrs. Kidder, Peabody & Co. and Foote & French, of Boston. The proceeds of the sale are to be used in retiring the company's floating debt. It is understood that the company receives about par for the bonds.

Great Northwest Central.—Chancellor Boyd, of Toronto, Ont., has set aside the judgment for $622,000 recently obtained by A. Charlebois against the railroad company. The road was built in 1890, Charlebois being the chief contractor. A dispute arose as to his compensation, and he refused to transfer the road to the stockholders until recently, when the company secured an order of the court compelling him to surrender the property. The suit just decided probably ends the litigation.

Kansas City, Memphis & Birmingham.—A plan of reorganization was published this week, which provides for the issue of new first mortgage bonds and income bonds, in exchange for the present first mortgage bonds. The existing mortgage bonds outstanding amount to $6,892,000, and with extension coupon notes and overdue coupons, the amount is $7,925,800. The new first mortgage which it is proposed to issue will be to secure $4,500,000 bonds, for 40 years, bearing two per cent. interest for one year, three per cent. for the next year and four per cent. thereafter. Income bonds will be issued amounting to $7,000,000, bearing five per cent. interest, nor cumulative. Holders of present five per cent. first mortgage bonds will receive in exchange for their bonds 40 per cent. of their holdings in the new mortgage bonds and 80 per cent. in income bonds. If the foregoing plan is accepted by the holders of the present first mortgage securities, it will call for $3,170,320 of the new mortgage bonds and $6,340,640 of the income bonds. There will remain in the treasury of the company $1,330,000 of the new mortgage bonds and $659,360 of the income bonds, to be used only for the purpose of retiring the outstanding equipment bonds, or, so far as they are not required for that purpose, for improvement of the mortgaged property. Under this scheme the annual fixed charge for the mortgage bonds proposed to be now issued will be $63,406 for the first year, $95,109 for the second year and $126,812 thereafter, to which should be added $71,340, the annual interest on the equipment bonds. It is estimated that the net earnings for the fiscal year ending June 30, 1894, including the traffic guaranty, will not amount to over $156,000, which, however, will take care of the interest upon the proposed new bonds, and present equipment bonds for the first year with a small surplus.

Lake Erie, Alliance & Southern.—E. E. Scranton, General Manager of the company, has been appointed Receiver in the suit brought by the Central Trust Company of New York, which was mentioned in last week's paper. The appointment is made by the Common Pleas Court at Canton, O.

Long Beach.—This road was sold last week at sheriff's sale to President W. J. Sewell, of the West Jersey Company, for $75,000. The road extends from Barnegat City to the north end of Long Beach and to Beach Haven, at the southern extremity of the island, and includes a branch which crosses Barnegat Bay, by a pile bridge, and connects with the Tuckerton Railroad at Manahawkin, N. J. The foreclosure proceedings were instituted by the Pennsylvania Railroad, which was the principal mortgage creditor, and the purchase of the road in its interest means its practical abandonment in the future.

Louisville & Nashville.—The company has paid off the loan it made in London last summer and has thereby released 22,000 shares of treasury stock held as collateral. The financial officers in New York City state that neither this stock nor the additional issue $5,000,000 authorized by the stockholders has been sold or placed under control of a guaranty syndicate.

Marietta & North Georgia. — The United States Circuit Court at Knoxville, Tenn., has denied the petition of the Central Trust Co. to affirm the recent decree of sale of the Marietta & North Georgia and Knoxville Southern railroads made at Atlanta, and the sale at Atlanta will only include the portion of the road located in Georgia.

Mary Lee Coal & Railway Co.—J. B. Scott and J. A. Montgomery, the latter President of the company, have been appointed Receivers for the company, which owns and operates extensive coal mines and coke ovens as well as a short line of railroad in Jefferson County, Ala. This action was begun by the Mercantile Trust Co., of Baltimore, which holds half the stock and all the bonds. The proceeding is a friendly one, and the company's business will not be interrupted.

Mexican Southern.—The recent report of the appointment of a receiver for this road is denied in the last issues of the Mexican papers just at hand. The denial is said to be made on official authority. The company has been very unfortunate since the road was put in operation, and has had to contend with extraordinary difficulties in the operation of the line, as mentioned in a recent issue. The road was only in operation a short time when it was blocked last June by washouts and landslides. No trains could be run during June or July, but on Aug. 15 traffic was again resumed, and was maintained throughout the most of September. From Sept. 25 to Oct. 13 the road was again blocked, but since the latter date trains have been running regularly.

New York & Northern.—Justice Andrews, of the New York Supreme Court, has denied the application for an injunction to restrain the New York Central & Hudson River Railroad Company from voting the stock of the above company owned by it. The Court holds that the New York Central had the right, under the New York Statutes, to purchase and hold the stock. The regular time for the annual meeting is in November, but this year the meeting was postponed until a decision was given in the pending litigation.

Northern Pacific.—The estimated gross earnings of the company for the month of November, 1893, were $1,734,838, and compare with actual gross earnings for the same period of 1892 of $2,392,042, showing a decrease of $657,204.

Philadelphia & Reading.—The earnings of the railroad company for the month of October are given in the following table:

	1893.	1892.	Inc. or dec.
Gross earn.	$2,127,430	$2,248,219	D. $120,789
Oper. exp	1,074,260	1,204,433	D. 130,164
Net earn.	$1,053,161	$1,043,786	I. $9,375
Other income	54,777	76,839	D. 22,061
Profit for month	$1,107,938	$1,120,624	D. $12,686

The petition of the Receivers of the railroad for authority to modify the existing contract between the company and the Finance Company of Pennsylvania has been approved by Judge Dallas of the United States Court at Philadelphia. The proposed modification of the contract will enable the Receivers to obtain advances from the Finance Company to the amount of $3,000,000, instead of $1,000,000 as under the old agreement.

Pittsburgh, Cincinnati, Chicago & St. Louis.—Quo warranto proceeding have been brought in the Supreme Court of Ohio by the Attorney General of that state to compel this company to remove its tracks, station and car sheds at Cincinnati from valuable land which they now occupy, on the ground that the land belongs to the state. On April 28, 1863, the state made a deed to Cincinnati for the land, conditioned on its being used as a public highway. In 1867 that city gave the Little Miami railroad some right to erect the buildings which now occupy the site. The state claims that as the land is not used for highway purposes, it reverts to the state. This is a test case which railroads having terminals at Cleveland, Toledo and other cities in Ohio are interested in, as the value of canal lands occupied by railroads in these places by right of grants from municipalities will be affected by the result of the suit.

Toledo, Peoria & Western. — The Pennsylvania has purchased a controlling interest in the capital stock and also a large amount of the bonds of the above company. This line forms the natural extension of the Pittsburg, Cincinnati, Chicago & St. Louis, from its terminus at the State line between Indiana and Illinois to the Mississippi River at Burlington and Keokuk, a distance of about 230 miles. It traverses a productive corn district, and passes through Peoria. Its acquisition has been a subject of negotiation for a number of years past, but has only been consummated with in a brief period. In addition to its value for local traffic it forms a direct connection with the Chicago, Burlington & Quincy via Peoria and Burlington. This purchase extends the system of the Pennsylvania to important points on the banks of the Mississippi River.

Union Pacific, Denver & Gulf.——The suit of ex-Governor Evans, of Denver, who was President of the road before its lease to the Union Pacific for a separate receiver, which was argued for the last week in the United States Circuit Court at Denver, has been decided in his favor. The present proceedings were instituted before the appointment of receivers for the Union Pacific system, ex-Governor Evans asking for the appointment of a separate receiver for the road, claiming that the Union Pacific was operating the road to the disadvantage of the property, and for its own benefit. The court has not named a receiver, postponing the appointment with the expectation that both parties to the suit will agree upon a receiver satisfactory to each.

Western New York & Pennsylvania.—The plan of reorganization of this company is still withheld, although its terms have been decided upon. The following explanations of the terms of the new plan, published in a Philadelphia paper, seem to have been obtained from authentic sources, however. A reduction in the outstanding funded debt of about $5,400,000 and a reduction in fixed interest of say $400,000 will be effected. The capital stock will also be reduced from $30,000,000 to $20,000,000. The stockholders will be called upon to pay an assessment of $3.50 per share and give up 25 per cent. of their holdings in stock of a par of $100; but, as the new stock to be issued is to be of a par of $50, the result will be that each stockholder depositing 100 shares and paying the assessment thereon of $350 will receive in return therefor 150 shares of new stock of $50 par, and, in addition, each 100 shares so deposited will receive $1,250 in new third mortgage income bonds.

When the company is reorganized the securities outstanding will be:

First mortgage bonds	$9,200,000
Warren and Franklin bonds	800,000
General mortgage bonds	10,000,000
Third mortgage income bonds	10,000,000
Capital stock	20,000,000
	$50,000,000

As against the present issue:

First mortgage and Warren and Franklin bonds	$10,000,000
Second mortgage bonds	20,000,000
Convertible income scrip and debentures	5,000,000
Inconvertible scrip	400,000
Capital stock	30,000,000
	$65,400,000

TRAFFIC.

Traffic Notes.

General Manager Peck, of the Texas Car Service Association, has reminded the agents in his territory that a telephone notice of demurrage charges due will not be recognized as legal by the courts. All such notices must be served in writing.

The Railroad Commissioners of Missouri have issued an order that the present merchandise rates of the express companies in that state must be reduced 10 per cent. Jan. 1. The Board had previously resolved to make a reduction of 20 per cent., but the matter was reconsidered.

Tickets sold for the New York & Chicago Limited between Pittsburgh and Chicago are now of the ordinary form, no extra fare being charged. A similar announcement was made by the Michigan Central as regards the limited train on that road between Buffalo and Chicago, when the time was lengthened, Nov. 19.

The receipts of flour and grain at Buffalo by lake from the opening of navigation to Dec. 1 of this year were 181,890,992 bushels, flour being reduced to bushels. This is 10,247,131 bushels more than for the same period of 1892. A dispatch from Buffalo Dec. 2 reported that all expected vessels had arrived in port except about 20.

The agreement which the railroads of Atlanta have made concerning free delivery of freight provides for the continuance of the delivery of freight for other roads over the tracks of the Western & Atlantic, but apparently under closer restrictions than have heretofore been in force. The Western & Atlantic is also to be released from certain liabilities.

The pool of the Mexican railroads on freight from Europe bound for the City of Mexico has been renewed for a period of one year from Sept. 1 last. This includes freight by all of the railroad routes, including the Mexican Railway. One account says that the pool covers all traffic which is competitive as between the Mexican Railway and the roads entering from the United States.

The Missouri Pacific has notified the Kansas Railroad Commissioners that it will comply with the recent ruling of the Board reducing the rate on agricultural implements from 32½c. per 100 lbs. to 23½c. from the Missouri River to Wichita. The company also announced its intention of adjusting the rates of the articles named to all points in the state on the basis of Wichita rate.

The United States Circuit Court at Chicago has decided that a state court has no jurisdiction to determine the reasonableness of rates on interstate commerce; there is no common law of the United States which controls rates, and the common law of the states does not apply outside those states. The case was that of Swift & Co., dressed beef shippers, against the Philadelphia & Reading Railroad to recover excessive charges alleged to have been made on freight shipments, in violation of the provision of the interstate commerce law requiring that rates shall be reasonable. There are 20 or more of these suits pending against various trunk lines. The plaintiffs will probably appeal.

Senator Cullom has introduced in the United States Senate a bill to amend the Interstate Commerce Law so as to compel one railroad to accept traffic from another and to strengthen the clause prohibiting discrimination between roads in the acceptance of traffic. Mr. Cullom also presented an amendment repealing the imprisonment clause as affecting violators of the Interstate Commerce Law. Another amendment offered is one defining the word "line." This is to correct the ruling of the United States Court in the Chicago & Northwestern case, which is familiar to our readers. It would seem useless, if not absurd, to make this the subject of a legislative act. If the suit which brought out this decision is appealed to the Supreme Court there can be little doubt that the view of the Interstate Commerce Commission, that a joint line is simply two or more pieces of track owned by different companies, over which freight is carried by joint agreement, would be sustained.

Chicago Traffic Matters.

CHICAGO, Dec. 6, 1893.

As intimated in my last two letters, the eastbound freight situation has culminated in an open reduction of commodity rates to the seaboard. The Erie, becoming restive under the restraint imposed by the agreement and professing to have evidence that its competitors were secretly manipulating rates (which appears to be well substantiated), determined to take the initiative prior to the putting in effect of the resolution adopted at the last meeting of the Joint Committee to maintain rates after Dec. 1, and on Nov. 29 reduced the tariff on fertilizer and green and salted hides. At the same time notice was filed, effective Dec. 2, reducing rates on poultry, eggs, butter, etc. On Dec. 3 the grain rate was reduced to the basis of 20 cents per 100 lbs., Chicago to New York, a reduction of 5 cents; and yesterday the rate on provisions was reduced from 30 to 22½ cents, and on bulk meats from 35 to 27½. A meeting of the Central Traffic Association has been hastily called for Dec. 13, but before that time the demoralization is likely to become widespread. The trouble is by some charged to the action of the New York Central in endeavoring to equalize the differentials allowed the Pennsylvania at Philadelphia and Baltimore, but the real cause apparently lies back of that, and is due to the failure of the Eastern lines to satisfactorily adjust the export situation. No one disputes that it is a most difficult problem to solve, but the fact remains that if the eastbound lines would come together with a determination on the part of the executive officers to settle the question once for all, it could be done. The trouble is that none of the lines are apparently willing to concede anything.

There was a little trouble in the local passenger association last week over the action of the association in fining the Rock Island for alleged payment of street commissions. The Rock Island entered a vigorous protest which resulted in the local association deciding that it had no jurisdiction, and referring the whole matter to the general association for adjudication.

The Western lines have voted down a proposition to change the present basis of passenger commissions.

Charges have been preferred against the Chicago Great Western for a violation of the agreement of the Western Passenger Association in offering reduced rates for excess baggage for a detachment of troops. The Quartermaster obtained a bid from the Chicago Great Western, as well as other lines, it is claimed, and showed the bid of the Chicago Great Western to a competitor, who preferred charges. The case has been heard by the Chairman, but no decision has yet been rendered.

The Western lines are holding meetings at important junction points looking toward the perfecting of a pass agreement for the ensuing year which shall restrict the issuing of passes to shippers, etc. The attempt has been regularly made for the past three or four years, but has always failed from want of unanimity.

The Joint Committee and the Central Traffic Association have agreed that hereafter petroleum and its products in tank cars will be delivered only when consigned to parties at points at which they have proper unloading and storage facilities, and when shipments in tank cars are sent to parties who have not such facilities the oil will be returned to shippers at their risk and expense.

The shipments of eastbound freight, not including livestock, from Chicago, by all the lines, for the week ending Dec. 2 amounted to 45,452 tons, against 53,981 tons during the preceding week, a decrease of 8,529 tons, and against 61,818 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Dec. 2.		W'k to Nov. 25.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	5,696	12.5	7,271	13.5
Wabash	2,527	5.6	3,819	7.1
Lake Shore & Michigan South.	9,651	21.2	8,712	16.1
Pitts., Ft. Wayne & Chicago.	6,177	13.6	6,766	12.5
Pitts., Cin., Chicago & St. Louis	7,319	16.1	8,391	15.6
Baltimore & Ohio	2,383	5.2	2,616	4.9
Chicago & Grand Trunk	3,893	8.6	3,535	6.5
New York, Chic. & St. Louis	2,720	6.0	4,187	7.7
Chicago & Erie	3,343	7.4	6,788	12.6
C., C., C. & St. Louis	1,733	3.8	1,896	3.5
Totals	45,452	100.0	53,981	100.0

Of the above shipments 1,854 tons were flour, 17,725 tons grain and millstuff, 9,385 tons cured meats, 8,952 tons dressed beef, 931 tons butter, 1,645 tons hides and 2,600 tons lumber. The three Vanderbilt lines carried 39.7 per cent., the two Pennsylvania lines 29.7 per cent. The Lake lines carried 47,031 tons, against 66,326 tons during the preceding week, a decrease of 19,295 tons.

(Other Chicago traffic news will be found on page 887.)